Volume 082
Article 03

IDAHO
DEPARTMENT OF FISH AND GAME

Jerry M. Conley. Director

FEDERAL AID IN FISH RESTORATION

Job Performance Report

Project F-71-R-14

REGIONAL FISHERIES MANAGEMENT INVESTIGATIONS

Job No. 1-a.	Region 1 Mountain Lakes Investigations
Job No. 1-b.	Region-Lowland Lakes Investigations
Job No. 1-c.	Region 1 Rivers and Streams Investigations
Job No. 1-d.	Region 1 Technical Guidance

By

Melo A. Maiolie, Regional Fishery Biologist
James A. Davis, Regional Fishery Biologist
Ned Horner, Regional Fishery Manager

January 1991

TABLE OF CONTENTS

LIST OF TABLES

TABLE OF CONTENTS (Cont.)

R189TOC

TABLE OF CONTENTS (Cont.)

LIST OF TABLES

LIST OF FIGURES

Page

LIST OF FIGURES (Cont.)

Page

TABLE OF CONTENTS (Cont.)

LIST OF TABLES

LIST OF TABLES (Cont.)

LIST OF FIGURES

TABLE OF CONTENTS (Cont.)

LIST OF TABLES

JOB PERFORMANCE REPORT

State of: **Idaho**

Name: **REGIONAL FISHERY MANAGEMENT INVESTIGATIONS**

Project No.: **F-71-R-14**

Title: **Region 1 Mountain Lakes Investigations**

Job No.: **1-a**

Period Covered: **July 1, 1989 to June 30, 1990**

ABSTRACT

During 1989, management personnel coordinated with the Forest Service, conservation officers, hatchery personnel, and sportsmen to manage mountain lakes in Region 1. Westslope cutthroat fry were stocked in 26 lakes. Domestic Kamloops rainbow were stocked in four lakes, brook trout in one, and two lakes received grayling. Drive-to lakes were stocked with catchable-size Mt. Lassen and Shepherd of the Hills stock rainbow. Mountain lake releases in the region are summarized for the past 13 years.

Author:

Ned Horner
Regional Fishery Manager

R189RPT

OBJECTIVES

1. To develop improved management plans for fish populations of mountain lakes in Region 1.

2. To evaluate limnological conditions in selected mountain lakes, their fish populations, angler satisfaction and preferences. Use new and existing information on angler use, water quality, species history, spawning potential, stocking success, and lake morphology to develop the potential of these waters for providing diverse angling experiences.

METHODS

Information on mountain lakes in Region 1 was reviewed with hatchery personnel and individuals from other agencies and groups to coordinate releases of fish in 1989. The stocking program was based on previous history, reports of fishing quality, and availability of fish for release in 1989.

RESULTS

The mountain lake stocking program for 1989 was completed with minimal changes. Westslope cutthroat were stocked in 26 lakes, all that had been requested.

Only four lakes were not stocked in 1989 due to the lack of specialty stocks of fish. Two lakes received grayling. Only four lakes were stocked with domestic Kamloops rainbow fry in 1989, and Bloom Lake continued to receive brook trout. Golden trout were not available in 1989. Stocking histories for all mountain lakes in Region 1 are summarized in Table 1 for the period 1977 to 1989.

Not enough creel census data was available for 1989 to evaluate program goals.

The stocking schedule for Region 1 mountain lakes attempts to balance the number of each species of fish and the number of lakes to be stocked each year (Tables 2 and 3). Deviations from the schedule have most often been caused by lack of fish, lack of proper sized fish (too large at stocking time), or conflicts with other hatchery programs. Lakes in the Little North Fork Clearwater drainage were stocked by plane from the McCall Hatchery in 1989.

Species diversity will be maintained by utilizing westslope cutthroat and domestic Kamloops rainbow for most lakes, golden and grayling (when available) for specialty lakes, and brown trout for attempted control of stunted brook trout. Bull trout may be used to control brook trout once

Table 1. Number and species of fish (fry except where noted) stocked into mountain lakes in Region 1 from 1977-1989.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Kootenai	Hidden	50	1977	5,800	232	Henrys Lake cutthroat	
	(1-103)		1979	5,486	109	Henrys Lake cutthroat	
			1979	5,300	106	Kamloops rainbow	
			1981	15,922	318	Westslope cutthroat	
			1982	15,656	313	Kamloops rainbow	
			1983	12,107	242	Henrys Lake cutthroat	
			1984	12,768	255	Kamloops rainbow	
			1985	12,512	250	Westslope cutthroat	
			1986	6,000	120	Westslope cutthroat	
			1987	12,500	250	Westslope cutthroat	
			1988	12,096	242	Kamloops rainbow	
			1989	3,082	62	Kamloops rainbow	
			1989	12,495	250	Westslope cutthroat	
	Lake Mountain	7	1977	2,910	416	Henrys Lake cutthroat	
	(Cuttoff)		1979	3,424	346	Henrys Lake cutthroat	
	(1-104)		1983	1,723	246	Henrys Lake cutthroat	
			1985	1,748	250	Westslope cutthroat	
			1987	1,750	250	Westslope cutthroat	
			1989	1,750	250	Westslope cutthroat	
	West Fork	12	1978	7,704	642	Henrys Lake cutthroat	
	(1-109)		1979	3,184	265	Kamloops rainbow	
			1981	6,704	559	Westslope cutthroat	
			1982	3,648	304	Kamloops rainbow	
			1983	3,016	251	Henrys Lake cutthroat	
			1984	3,010	251	Kamloops rainbow	
			1985	2,990	250	Westslope cutthroat	
			1986	4,495	375	Westslope cutthroat	
			1987	3,000	250	Westslope cutthroat	
			1988	3,007	250	Westslope cutthroat	
			1989	3,087	257	Kamloops rainbow	

R189T1

Table 1. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Kootenai	Long Mountain (1-112)	3	1987	1,000	333	Grayling	
	Parker (1-113)	3	1979	2,220	740	Golden trout	
			1986	1,225	408	Golden trout	
			1988	1,002	334	Grayling	
	Smith (Long Canyon) (1-115)	6	1987	2,000	333	Grayling	
			1988	3,000	500	Grayling	
	Big Fisher (1-117)	10	1977	6,295	630	Henrys Lake cutthroat	
			1979	3,030	303	Henrys Lake cutthroat	
			1981	3,352	335	Westslope cutthroat	
			1983	2,486	248	Henrys Lake cutthroat	
			1985	2,530	253	Westslope cutthroat	
			1987	2,500	250	Westslope cutthroat	
	Myrtle (1-122)	20	1977	6,240	312	Henrys Lake cutthroat	
			1979	6,060	303	Henrys Lake cutthroat	
			1983	5,189	259	Westslope cutthroat	
			1985	5,100	255	Westslope cutthroat	
			1987	5,000	250	Westslope cutthroat	
			1989	5,000	250	Westslope cutthroat	
	Trout (1-124)	7	1977	2,562	366	Kamloops rainbow	
			1979	2,120	303	Kamloops rainbow	
			1981	2,514	359	Westslope cutthroat	
			1982	3,296	471	Kamloops rainbow	
			1983	1,720	247	Henrys Lake cutthroat	
			1984	1,733	248	Kamloops rainbow	
			1985	1,748	250	Westslope cutthroat	
			1986	1,721	246	Westslope cutthroat	
			1987	1,751	250	Westslope cutthroat	
			1988	1,743	250	Westslope cutthroat	

Table 1. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Kootenai	Pyramid (1-125)	11	1977	3,600	333	Kamloops rainbow	
			1977	81	7	Henrys Lake cutthroat	
			1979	3,710	337	Kamloops rainbow	
			1981	4,190	381	Westslope cutthroat	
			1982	3,296	300	Kamloops rainbow	
			1983	2,702	246	Henrys Lake cutthroat	
			1984	2,736	249	Kamloops rainbow	
			1985	2,760	251	Westslope cutthroat	
			1986	2,741	249	Westslope cutthroat	
			1987	2,750	250	Westslope cutthroat	
			1988	2,752	250	Westslope cutthroat	
			1989	2,750	250	Kamloops rainbow	
	Ball Creek (1-126)	6	1978	3,184	531	Henrys Lake cutthroat	
			1980	2,136	356	Westslope cutthroat	
			1983	1,513	255	Henrys Lake cutthroat	
			1984	1,000	167	Westslope cutthroat	
			1986	1,498	250	Westslope cutthroat	
			1988	1,500	250	Westslope cutthroat	
	Little Ball Creek (1-127)	4	1980	1,424	356	Westslope cutthroat	
			1984	1,500	375	Westslope cutthroat	
			1986	956	239	Westslope cutthorat	
			1988	1,000	250	Westslope cutthroat	
	Snow (1-134)	10	1978	3,184	318	Henrys Lake cutthroat	
			1979	3,030	303	Henrys Lake cutthroat	
			1982	3,008	301	Westslope cutthroat	
			1983	2,872	287	Henrys Lake cutthroat	
			1987	2,500	250	Westslope cutthroat	
			1989	2,400	240	Westslope cutthroat	

Table 1. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Kootenai	Roman Nose #3	12	1977	2,080	168	Catchable rainbow	
	(1-137)		1977	3,072	256	Henrys Lake cutthroat	
			1978	3,360	280	Henrys Lake cutthroat	
			1979	5,300	442	Kamloops rainbow	
			1983	2,320	193	Domestic Kamloops (size 2)	
			1985	3,000	250	Westslope cutthroat	
			1986	3,000	250	Westslope cutthroat	
			1987	3,000	250	Westslope cutthroat	
			1988	3,000	250	Westslope cutthroat	
			1989	3,000	250	Kamloops rainbow	
	Solomon	9	1977	3,120	347	Henrys Lake cutthroat	
	(1-146)		1978	4,704	523	Henrys Lake cutthroat	
			1979	5,062	562	Kamloops rainbow	
			1982	3,040	338	Kamloops rainbow	
			1983	2,162	240	Henrys Lake cutthroat	
			1984	2,268	252	Kamloops rainbow	
			1985	2,250	250	Westslope cutthroat	
			1986	2,500	278	Westslope cutthroat	
			1987	2,250	250	Westslope cutthroat	
			1988	2,250	250	Westslope cutthroat	
			1989	712		Westslope cutthroat (broodstock)	
	Spruce	5	1977	6,292	1,258	Henrys Lake cutthroat	
	(1-147)		1978	5,136	1,027	Henrys Lake cutthroat	
			1980	2,509	502	Westslope cutthroat	
			1982	2,432	486	Kamloops rainbow	
			1983	1,297	259	Henrys Lake cutthroat	
			1984	2,520	504	Kamloops rainbow	

R189T1

Table 1. Continued.

Drainage	Lake	Surface acres	Year stocke	Number stocke	Stocking rate (fish/acre)	Stock of fish	Comments
Kootenai	Spruce		1985	1,250	250	Westslope cutthroat	
	(1-147)		1986	1,250	250	Westslope cutthroat	
			1987	1,250	250	Westslope cutthroat	
			1988	1,250	250	Westslope cutthroat	
			1989	1,265	253	Westslope cutthroat	
	Queen	5	1978	3,184	637	Henrys Lake cutthroat	
	(1-148)		1980	1,770	354	Westslope cutthroat	
			1983	1,296	259	Henrys Lake cutthroat	
			1986	1,250	250	Westslope cutthroat	
			1988	1,250	250	Westslope cutthroat	
	Debt	5	1985	1,250	250	Westslope cutthroat	
	(1-150)		1989	1,250	250	Westslope cutthroat	
	Copper	5	1978	2,016	403	Henrys Lake cutthroat	
	(1-154)		1980	2,091	418	Westslope cutthroat	
			1983	1,297	259	Henrys Lake cutthroat	
			1984	1,390	278	Westslope cutthroat	
			1986	1,250	250	Westslope cutthroat	
			1988	1,247	250	Westslope cutthroat	
	Callahan (Smith)	10	1978	2,688	269	Henrys Lake cutthroat	
	(1-166)		1979	3,636	364	Henrys Lake cutthroat	
			1984	2,500	250	Westslope cutthroat	
			1987	2,522	252	Westslope cutthroat	
			1988	2,500	250	Westslope cutthroat	
Pend Oreille	Hunt	12	1977	4,000	333	Golden trout	
	(2-101)		1979	3,180	265	Kamloops rainbow	
			1982	3,648	304	Kamloops rainbow	
			1985	3,000	250	Westslope cutthroat	

R189T1

Table 1. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
<u>Pend Oreille</u>	Hunt		1986	3,000	250	Westslope cutthroat	
	(2-101)		1986	3,033	253	Westslope cutthroat	
			1988	3,000	250	Westslope cutthroat	
			1989	5,000	417	Westslope cutthroat	
	Standard	16	1978	7,074	442	Henrys Lake cutthroat	
	(2-103)		1980	5,472	342	Westslope cutthroat	
			1983	4,021	251	Henrys Lake cutthroat	
			1985	4,000	250	Westslope cutthroat	
			1987	3,962	248	Westslope cutthroat	
			1989	4,000	250	Westslope cutthroat	
	Two Mouth #1	?	1979	2,456		Henrys Lake cutthroat	Discontinue stocking
	(2-106)		1981	2,258		Westslope cutthroat	due to winter kill
	Two Mouth 12	5	1979	2,456	491	Henrys lake cutthroat	
	(2-107)		1981	2,258	452	Westslope cutthroat	
			1983	2,054	411	Henrys Lake cutthroat	
			1985	1,265	253	Westslope cutthroat	
			1987	1,269	254	Westslope cutthroat	
			1989	1,265	253	Westslope cutthroat	
	Two Mouth #3	20	1977	9,444	472	Henrys Lake cutthroat	
	(2-108)		1979	6,140	307	Henrys Lake cutthroat	
			1981	6,774	339	Westslope cutthroat	
			1983	4,973	249	Henrys Lake cutthroat	
			1984	5,280	264	Westslope cutthroat	
			1986	5,000	250	Westslope cutthroat	
			1988	5,000	250	Westslope cutthroat	

R189T1

Table 1. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
<u>Pend Orielle</u>	Mollies (2-114)	2	1978	2.016	1.008	Henrvs Lake cutthroat	
			1981	3,352	1,672	Westslope cutthroat	
			1983	648	324	Henrys Lake cutthroat	
			1985	506	253	Westslope cutthroat	
			1987	508	254	Westslope cutthroat	
			1989	500	250	Westslope cutthroat	
	Caribou (near West Fk. Mtn) (2-116)	6.8	1980	2,052	302	Westslope cutthroat	
			1984	1,752	258	Henrys Lake cutthroat	
			1986	1,750	257	Westslope cutthroat	
			1987	1,750	257	Westslope cutthroat	
			1988	1,750	257	Westslope cutthroat	
	Fault (Hunt Peak #1) (2-121)	6	1978	2,016	336	Henrys Lake cutthroat	
			1979	3,184	531	Kamloops rainbow	
			1981	2,258	376	Westslope cutthroat	
			1983	2,872	478	Henrys Lake cutthroat	
			1985	1,500	250	Westslope cutthroat	
			1987	1,500	250	Westslope cutthroat	
			1989	1,553	259	Westslope cutthroat	
	McCormick (Hunt Peak #2) (2-122)	3.1	1977	2,544	832	Henrys Lake cutthroat	
			1979	1,592	513	Kamloops rainbow	
			1981	2,258	728	Westslope cutthroat	
			1985	780	252	Westslope cutthroat	
			1987	775	250	Westslope cutthroat	
			1989	805	260	Westslope cutthroat	

R189T1

Table 1. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Pend Oreille	Little Harrison (2-126)	6.5	1977	3,148	484	Henrys Lake cutthroat	
			1979	2,424	373	Henrys Lake cutthroat	
			1981	2,258	347	Westslope cutthroat	
			1983	1,651	254	Henrys Lake cutthroat	
			1987	1,625	250	Westslope cutthroat	
			1988	1,625	250	Westslope cutthroat	
	Beehive (2-128)	7	1977	3,148	450	Henrys Lake cutthroat	
			1979	2,424	346	Henrys Lake cutthroat	
			1981	2,258	323	Westslope cutthroat	
			1983	1,723	246	Henrys Lake cutthroat	
			1985	1,740	248	Westslope cutthroat	
			1986	1,803	258	Westslope cutthroat	
			1987	1,750	250	Westslope cutthroat	
			1989	2,164	309	Westslope cutthroat	
	Harrison (2-129)	29	1978	10,272	354	Henrys Lake cutthroat	
			1979	3,184	110	Kamloops rainbow	
			1981	9,218	318	Westslope cutthroat	
			1982	6,972	240	Kamloops rainbow	
			1983	7,243	250	Henrys Lake cutthroat	
			1984	7,296	250	Kamloops rainbow	
			1985	7,200	248	Westslope cutthroat	
			1986	6,870	237	Westslope cutthroat	
			1987	7,264	250	Westslope cutthroat	
			1988	7,250	250	Westslope cutthroat	
			1989	7,479	258	Westslope cutthroat	

Table 1. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Pend Oreille	Beaver	5	1977	3,840	770	Brook trout	Natural reproduction
	(2-130)		1980	1,936	387	Brook trout	
	Estelle	5	1988	1,075	215	Brown trout	Test control of
	(2-167)						stunted brook trout
	Dennick	8	1977	3,144	393	Henrys Lake cutthroat	
	(2-171)		1978	2,568	321	Henrys Lake cutthroat	
			1980	2,509	314	Westslope cutthroat	
			1981	5,800	725	Westslope cutthroat	
			1983	1,939	242	Henrys Lake cutthroat	
			1984	2,060	258	Westslope cutthroat	
			1985	2,010	251	Westslope cutthroat	
			1986	2,500	312	Westslope cutthroat	
			1987	2,000	250	Westslope cutthroat	
			1988	2,000	250	Westslope cutthroat	
			1989	2,064	258	Westslope cutthroat	
	Sand	5	1977	2,096	419	Henrys Lake cutthroat	
	(2-172)		1978	3,184	637	Henrys Lake cutthroat	
			1980	2,509	502	Westslope cutthroat	
			1981	3,480	696	Westslope cutthroat	
			1982	8,360	1,672	Kokanee	
			1983	1,221	244	Henrys Lake cutthroat	
			1984	1,254	251	Westslope cutthroat	
			1985	1,260	252	Westslope cutthroat	
			1986	1,250	250	Westslope cutthroat	
			1987	1,250	250	Westslope cutthroat	
			1988	1,247	250	Westslope cutthroat	
			1989	1,250	250	Westslope cutthroat	

Table 1. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
<u>Pend Oreille</u>	Bloom	20	1977	7,852	392	Brook trout	
	(2-173)		1978	10,304	515	Brook trout	
			1979	13,680	684	Westslope cutthroat	
			1981	24,402	1,220	Brook trout	
			1982	10,620	531	Brook trout	
			1984	5,041	252	Brook trout	
			1985	4,599	230	Brook trout	
			1986	5,360	268	Brook trout	
			1987	5,000	250	Brook trout	
			1988	5,000	250	Brook trout	
			1989	5,000	250	Brook trout	
	Porcupine	13	1977	1,040	80	Catchable rainbow	
	(2-182)		1978	2,000	154	Catchable rainbow	
			1979	4,200	323	Catchable rainbow	
			1979	4,560	351	Kamloops rainbow	
			1980	4,440	342	Catchable rainbow	
			1982	1,296	100	Kamloops rainbow	
			1983	2,872	220	Domestic Kamloops (size 2)	
			1984	1,016	78	Catchable rainbow	
			1985	1,000	77	Catchable rainbow	
			1986	1,075	83	Mt. Lassen rainbow (size 3)	
			1987			--	Road washed out
			1988	600	46	Mt. Lassen rainbow (size 3)	
			1989	690	53	Mt. Lassen rainbow (size 3)	

R189T1

Table 1. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Pend Oreille	Moose	16.5	1987	1,000		Brown trout	Test control on
	(2-185)		1988	4,515		Brown trout	stunted brook trout
	Antelope	16	1977	4,000	250	Catchable rainbow	Access problems,
	(2-190)		1977	5,924	370	Henrys Lake cutthroat	stocking discon't
			1978	2,890	181	Catchable rainbow	
			1979	6,459	404	Catchable rainbow	
			1979	4,484	280	Kamloops rainbow	
			1980	4,970	311	Catchable rainbow	
			1981	5,000	312	Westslope cutthroat	
			1982	5,032	314	Westslope cutthroat	
			1989	200	--	Shepherd of the Hills rainbow (size 3)	
			1989	1,155	--	Mt. Lassen rainbow (size 3)	
	Caribou	6.8	1977	3,148	463	Henrys Lake cutthroat	
	(near Keokee Mtn.)		1978	2,568	378	Henrys Lake cutthroat	
	(2-196)		1983	2,872	422	Henrys Lake cutthroat	
			1984	1,750	257	Westslope cutthroat	
			1985	1,700	250	Westslope cutthroat	
			1986	1,500	220	Westslope cutthroat	
			1987	1,704	250	Westslope cutthroat	
			1988	1,722	253	Westslope cutthroat	
			1989	1,700	250	Westslope cutthroat	
Spokane	Mirror	5	1979	5,195	1,039	Henrys Lake cutthroat	Winter kill lake,
	(3-117)		1981	5,000	1,000	Westslope cutthroat	evaluate before further stocking.

Table 1. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Spokane	Elsie (3-119)	10	1977	1,505	151	Catchable rainbow	Stock catchable rainbow annually, other fish were show pond (SP) fish from Mullan Hatchery.
			1978	2,020	202	Catchable rainbow	
			1979	1,665	166	Catchable rainbow	
			1979	21	--	Dolly Varden (SP)	
			1980	3,190	319	Catchable rainbow	
			1981	3,875	388	Catchable rainbow	
			1981	49	--	Rainbow (SP)	
			1981	48	--	Cutthroat (SP)	
			1981	53	--	Brook trout (SP)	
			1981	14	--	Kokanee (SP)	
			1981	1	--	Dolly Varden (SP)	
			1982	1,440	144	Catchable rainbow	
			1983	1,500	150	Catchable rainbow	
			1984	2,865	286	Catchable rainbow	
			1985	3,005	300	Catchable rainbow	
			1986	3,024	302	Catchable rainbow	
			1987	2,000	200	Hapspur rainbow (size 3)	
			1988	4,050	405	Hayspur rainbow (size 3)	
			1989	2,856	284	Mt. Lassen rainbow (size 3)	
	Lower Glidden (3-123)	12	1977	1,680	140	Catchable rainbow	
			1978	2,486	207	Catchable rainbow	
			1979	4,240	353	Catchable rainbow	
			1980	2,030	169	Catchable rainbow	
			1981	1,950	162	Catchable rainbow	
			1982	1,880	157	Catchable rainbow	
			1983	1,000	83	Catchable rainbow	
			1984	4,945	412	Catchable rainbow	
			1985	3,018	251	Catchable rainbow	
			1986	3,011	251	Catchable rainbow	
			1987	3,277	273	Hayspur rainbow (size 3)	
			1988	3,001	250	Hayspur rainbow (size 3)	
			1989	2,836	236	Mt. Lassen rainbow (size 3)	

R189T1

Table 1. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Spokane	Upper Glidden (3-124)	10	1978	2,000	200	Kamloops rainbow	Evaluate Kamloops control of stunted brook trout.
			1980	992	99	Kamloops rainbow	
	Gold (3-125)	3	1978	500	167	Kamloops rainbow	
			1979	384	128	Brook trout	
			1981	1,000	333	Westslope cutthroat	
			1983	1,005	335	Henrys Lake cutthroat	
			1987	750	250	Westslope cutthroat	
			1989	750	250	Westslope cutthroat	
	Revett (3-130)	12	1980	992	83	Kamloops rainbow	Evaluate Kamloops control of stunted brook trout.
	Crater (3-133)	5	1979	5,000	1,000	Grayling	Reserve for grayling.
			1983	5,000	1,000	Grayling	
			1987	2,100	420	Grayling	
			1988	2,500	500	Grayling	
	Dismal (3-138)	?	1979	2,670	--	Catchable rainbow	Reduce stocking to 250 fish and evaluate.
			1980	870	--	Catchable rainbow	
			1983	1,500	--	Catchable rainbow	
			1984	537	--	Catchable rainbow	
			1985	490	--	Catchable rainbow	
			1986	253	--	Catchable rainbow	
			1987	249	--	Hayspur rainbow (size 3)	
			1988	260	--	Mt. Lassen rainbow (size 3)	
			1988	260	--	Hayspur rainbow (size 3)	
			1989	225	--	Mt. Lassen rainbow (size 3)	

R189T1

Table 1. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Spokane	Bacon	9	1979	4,156	462	Henrys Lake cutthroat	
	(3-144)		1981	4,000	444	Westslope cutthroat	
			1985	2,255	250	Westslope cutthroat	
			1987	2,250	250	Westslope cutthroat	
			1989	2,250	250	Westslope cutthroat	
	Forage	13	1977	4,000	308	Golden trout	Reserve for goldens
	(3-146)		1979	3,330	256	Golden trout	or grayling.
			1987	3,150	242	Golden trout	
			1988	3,250	250	Grayling	
			1989	2,000	154	Grayling	
	Halo	12	1979	5,195	433	Henrys Lake cutthroat	
	(3-147)		1981	5,000	417	Westslope cutthroat	
			1985	3,010	251	Westslope cutthroat	
			1987	3,000	250	Westslope cutthroat	
			1989	3,000	250	Westslope cutthroat	
	Crystal	10	1978	4,830	483	Henrys Lake cutthroat	
	(3-160)		1979	4,848	485	Henrys Lake cutthroat	
			1981	9,988	999	Westslope cutthroat	
			1983	4,380	438	Henrys Lake cutthroat	
			1985	2,510	251	Westslope cutthroat	
			1987	2,510	251	Westslope cutthroat	
			1988	2,500	250	Westslope cutthroat	
			1989	2,500	250	Westslope cutthroat	
Little North Fork Clearwater	Devils Club	4	1981	3,014	753	Westslope cutthroat	
	(6-113)		1986	1,000	250	Westslope cutthroat	
			1988	1,000	250	Westslope cutthroat	
	Big Talk	?	1986	1,500	--	Westslope cutthroat	
	(6-114)		1988	2,500	--	Westslope cutthroat	

R189T1

Table 1. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Little North Fork Clearwater	Larkins (6-117)	12	1979	3,117	260	Henrys Lake cutthroat	
			1981	3,014	251	Westslope cutthroat	
			1986	3,000	250	Westslope cutthroat	
			1988	3,000	250	Westslope cutthroat	
	Mud (6-118)	6	1979	3,117	520	Henrys Lake cutthroat	
			1981	3,014	502	Westslope cutthroat	
			1987	1,500	250	Westslope cutthroat	
			1989	1,500	250	Westslope cutthroat	
	Hero (6-119)	4	1979	3,117	779	Henrys Lake cutthroat	
			1981	3,014	753	Westslope cutthroat	
			1986	1,000	250	Westslope cutthroat	
			1988	1,000	250	Westslope cutthroat	
	Heart (6-122)	40	1979	3,117	78	Henrys Lake cutthroat	
			1981	3,014	75	Westslope cutthroat	
			1986	10,000	250	Westslope cutthroat	
	Northbound (6-123)	12	1979	3,117	260	Henrys Lake cutthroat	
			1981	3,014	251	Westslope cutthroat	
			1986	3,000	250	Westslope cutthorat	
			1988	3,000	250	Westslope cutthroat	
	Skyland (6-125)	13	1979	3,117	240	Henrys Lake cutthroat	
			1981	3,014	232	Westslope cutthroat	
			1987	3,250	250	Westslope cutthroat	
			1989	3,250	250	Westslope cutthroat	
	Fawn (6-126)	13	1979	3,117	240	Henrys Lake cutthroat	
			1981	3,014	232	Westslope cutthroat	
			1986	3,250	250	Westslope cutthroat	
			1988	3,250	250	Westslope cutthroat	

R189T1

Table 1. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Little North Fork Clearwater	Noseeum (6-130)	4	1977	1,500	375	Henrys Lake cutthroat	
			1978	1,900	475	Henrys Lake cutthroat	
			1981	1,174	294	Rainbow/cutthroat hyb.	
			1985	1,008	251	Westslope cutthroat	
			1987	1,000	250	Westslope cutthroat	
			1989	1,000	250	Westslope cutthroat	
	Steamboat (6-131)	9	1979	4,000	444	Grayling	Reserve for grayling
			1981	1,174	130	Rainbow/cutthroat hyb.	
			1986	2,000	222	Grayling	
			1988	4,500	500	Grayling	
			1989	2,000	222	Grayling	
	Copper (6-201)	3	1978	1,000	333	Henrys Lake cutthroat	
			1981	1,000	333	Westslope cutthroat	
			1981	1,000	333	Rainbow/cutthroat hyb.	
			1985	765	255	Westslope cutthroat	
			1989	750	250	Westslope cutthroat	
	Gold (6-202)	8	1986	2,000	250	Westslope cutthroat	
			1988	2,000	250	Westslope cutthroat	
	Tin (6-204)	3	1987	750	250	Westslope cutthroat	
			1988	750	250	Westslope cutthroat	
	Silver (6-205)	10	1978	2,000	200	Rainbow	
			1981	2,00	200	Westslope cutthroat	
			1981	888	89	Rainbow	
			1985	999	100	Mt. Lassen rainbow	
			1989	2,500	250	Westslope cutthroat	

R189T1

Table 2. Odd-year stocking schedule for Region 1 mountain lakes.

Lake	Code no.	Surface acres	No. stocked	Species	Substitute species
Kootenai					
Hidden	01-103	50	12,500	C2	K1
Lake Mtn.	01-104	7	1,750	C2	None
West Fork	01-109	12	3,000	K1	C2
Long Mtn.	01-112	3	1,500	GR	None
Parker	01-113	3	1,000	GN	GR
Smith	01-115	6	3,000	GR	None
Myrtle	01-122	20	5,000	C2	None
Pyramid	01-125	11	2,750	K1	C2
Snow	01-134	10	2,500	C2	None
Roman Nose #3	01-137	12	3,000	K1	C2
Spruce	01-147	5	1,250	K1	C2
Debt	01-150	5	1,250	C2	None
Callahan	01-166	10	2,500	C2	None
Pend Oreille					
Hunt	02-101	12	3,000	C2	None
Standard	02-103	16	4,000	C2	None
Two Mouth 12	02-107	5	1,250	C2	None
Mollies	02-114	2	500	C2	None
Fault	02-121	6	1,500	C2	None
McCormick	02-122	3.1	775	C2	None
Beehive	02-128	7	1,750	C2	None
Harrison	02-129	29	7,250	C2	None
Dennick	02-171	8	2,000	C2	None
Sand	02-172	5	1,250	C2	None
Bloom	02-173	20	5,000*	BK *Size 2	None
Caribou (near Keokee Mtn.)	02-196	6.8	1,700	C2	None
Spokane					
Gold	03-125	3	750	K1	None
Crater	03-133	5	2,500	GR	None
Bacon	03-144	9	2,250	C2	None
Forage	03-146	13	3,250	GN	GR
Halo	03-147	12	3,000	C2	None
Crystal	03-160	10	2,500	C2	None

R189T2

Table 2. Continued.

Lake	Code no.	Surface acres	No. stocked	Species	Substitute species
Little North Fork Clearwater					
Mud	06-118	6	1,500	K1	None
Skyland	06-125	13	3,250	K1	None
No Seeum	06-130	4	1,000	C2	None
Steamboat	06-131	9	4,500	GR	None
Copper	06-201	3	750	C2	None
Silver	06-205	10	2,500	K1	None

Total number of fish to be stocked:

C2 - 59,975
K1 - 19,750
GR - 11,500
GN - 4,250 (Grayling can be substituted for goldens)
BK - 5,000 Size 2

Table 3. Even-year stocking schedule for Region 1 mountain lakes.

Lake	Code no.	Surface acres	No. stocked	Species	Substitute species
Kootenai					
Hidden	01-103	50	12,500	K1	C2
West Fork	01-109	12	3,000	C2	K1
Long Mtn.	01-112	3	1,500	GR	None
Parker	01-113	3	1,000	GN	GR
Smith	01-115	6	3,000	GR	None
Big Fisher	01-117	10	2,500	C2	None
Trout	01-124	7	1,750	C2	K1
Pyramid	01-125	11	2,750	C2	K1
Ball Creek	01-126	6	1,500	C2	None
Little Ball Cr.	01-127	4	1,000	C2	None
Roman Nose #3	01-137	12	3,000	C2	K1
Spruce	01-147	5	1,250	C2	K1
Queen	01-148	5	1,250	C2	None
Copper	01-154	5	1,250	C2	None
Estelle	01-167	5	1,250	BN	None
Pend Oreille					
Hunt	02-101	12	3,000	C2	None
Two Mouth #3	02-108	20	5,000	C2	None
Caribou (near West Fk. Mtn.)	02-116	6.8	1,750	C2	None
Little Harrison	02-126	6.5	1,625	C2	None
Harrison	02-129	29	7,250	C2	None
Beaver	02-130	5	1,250	BN	None
Dennick	02-171	8	2,000	C2	None
Sand	02-172	5	1,250	C2	None
Bloom	02-173	20	5,000*	BK *Size 2	None
Moose	02-185	16.5	4,200	BN	None
Caribou (near Keokee Mtn.)	02-196	6.8	1,700	C2	None
Spokane					
Crater	03-133	5	2,500	GR	None
Forage	03-146	13	3,250	GN	GR

Table 3. Continued

Lake	Code no.	Surface acres	No. stocked	Species	Substitute
Little North Fork Clearwater					
Devils Club	06-113	4	1,000	C2	None
Big Talk	06-114	7	2,500	C2	None
Larkins	06-117	12	3,000	C2	None
Hero	06-119	4	1,000	C2	None
Heart	06-122	40	10,000	K1	None
Northbound	06-123	12	3,000	C2	None
Fawn	06-126	13	3,250	C2	None
Steamboat	06-131	9	4,500	GR	None
Gold	06-202	8	2,000	C2	None
Tin	06-204	3	750	K1	None

Total number of fish to be stocked:
C2 – 58,575
K1 – 23,250
GR – 11,500
GN - 4,250 (Grayling can be substituted for goldens)
BK - 5,000 Size 2
BN - 6,700

hatchery surpluses are available. We are no longer stocking any rainbow in mountain lakes in the Pend Oreille drainage to avoid diluting the wild Gerrard rainbow gene pool, and we will stock only westslope cutthroat in lakes specified for cutthroat.

RECOMMENDATIONS

1. Follow recommendations in Tables 2 and 3 regarding even or odd year stocking. Stock lakes that have been missed for several years, and temporarily discontinue stocking lakes where stunted fish populations are known to exist.

2. Obtain late egg takes (spring spawning) from domestic Kamloops rainbow trout so that the proper size fry are available for mountain lake stocking. If this is not possible, switch rainbow stocking to a different stock of fish.

3. Continue species diversity program by utilizing westslope cutthroat and Kamloops rainbow. Obtain grayling and golden trout so unique mountain lake fisheries can become a reality.

4. Use brown trout to control stunted brook trout populations. Evaluate bull trout and splake for the same purpose when stocks become available.

5. Utilize voluntary angler reports to assess fish populations and angler satisfaction. Develop or utilize existing angler report forms to obtain this data.

6. Work with the Forest Service and Boundary County backpackers to create a trail into Smith Lake to provide angling opportunity for grayling.

JOB PERFORMANCE REPORT

State of: **Idaho**

Name: **REGIONAL FISHERY MANAGEMENT INVESTIGATIONS**

Title: **Region 1 Lowland Lakes Investigations**

Project No.: **F-71-R-14**

Job No: 1-b

Period Covered: **July 1, 1989 to June 30, 1990**

ABSTRACT

Midwater trawling in Priest Lake was used to determine that none of the 1989 kokanee stocking strategies were successful at establishing a year class of kokanee. Survival of the 2.7 million kokanee stocked was estimated at 0.3% after the first two months. Since no age 2+ or 3+ kokanee were collected, past stocking also failed to establish detectable numbers of kokanee.

Spirit Lake had a moderately high year class of kokanee, so no supplemental stocking was recommended.

Bull trout redd counts in tributaries to Lake Pend Oreille increased over the past three years. This, coupled with the mean size of 551 mm in the harvest, indicated that the bull trout population has been stable.

Less restrictive bass regulations in Hayden Lake have not resulted in overharvest. Many larger-size bass were collected, and no "cropping" of the population at the legal size limit was found.

Sampling in Blue Lake indicated that it would be a likely candidate for a future rotenone project. Currently, the public does not support such a project, but they should be contacted in the future to see if it is acceptable. Jewel and Sinclair lakes were rotenoned during the fall of 1989. Both will be stocked in the spring of 1990 to reestablish salmonid populations.

Midwater trawling in Coeur d'Alene Lake indicated that total kokanee abundance has not declined, and size of adults has not increased in response to our chinook salmon program. Three changes have, however, been noted; 1) chinook weighed less for a given length; 2) survival rates among two age classes of kokanee declined significantly, and 3) the abundance of age 1+ kokanee dropped to its lowest point on record.

Growth rates between hatchery chinook (thought to be Lake Michigan stock) and wild chinook (thought to be Bonneville stock) were nearly identical. The wild stock tended to have a higher percentage of fish living to an older age class. Catch rates for chinook were the second best on record, which indicated the population of chinook in Coeur d'Alene Lake was continuing to increase.

Author:

Melo A. Maiolie
Regional Fishery Biologist

OBJECTIVES

1. To evaluate the stocking of different sizes and types of kokanee in Priest Lake.

2. To make recommendations on future kokanee stocking in Priest Lake.

3. To monitor the kokanee population in Upper Priest Lake to determine its status.

4. To evaluate bull trout harvest in lake Pend Oreille to assess potential overexploitation.

5. To assess the status of the bull trout population based on abundance of redds in selected tributaries of Lake Pend Oreille.

6. To determine the need for annual kokanee fry stocking in Spirit Lake based on the abundance of young-of-the-year (YOY) fish.

7. To determine the exploitation of largemouth bass in Hayden Lake.

8. To evaluate size frequency distribution of black crappie in Hayden Lake to determine if restrictive regulations are needed.

9. To document fish populations in Blue Lake (Bonner County) and evaluate as a site for a lake renovation project.

10. To determine kokanee stock status in Coeur d'Alene Lake and see if improvement due to chinook stocking has resulted.

11. To evaluate chinook stocks in Coeur d'Alene Lake in terms of growth rates.
12. To collect kokanee and chinook eggs for statewide needs.

PRIEST LAKE

Priest Lake (9,450 ha) has undergone dramatic changes in species composition since the early 1900s. Bull trout and cutthroat trout were the only native sport fish in the lake. By the 1950s, cutthroat trout abundance had been greatly reduced, and most of the sport fishery was for kokanee that were introduced in the 1940s (Bjornn 1957). The introduction of Mysis shrimp in 1965 helped the lake trout population expand by increasing juvenile survival but negatively affected kokanee abundance. To bolster the declining kokanee population, 1/2 to 3 million fry were stocked into the lake in recent years. Midwater trawling was continued in 1989 to document kokanee abundance and determine if stocking had significantly improved year class strength.

Kokanee

Methods

Trawling methodology and statistical analysis were as described by Bowles (1987). Four trawls were conducted in Upper Priest Lake at previously established stations (Figure 1). Trawls were parallel to the long axis of the lake at depths from 5 to 19 m. A similar methodology was used in Priest Lake, where thirteen trawls were conducted at previously established stations (Figure 1). Depths sampled ranged from 5 m to 19 m. The midwater trawl was towed by a 8.5-m, 140-horsepower diesel engine boat. The net was 13.7-m long with a 3-m by 3-m mouth. Mesh sizes (stretch measure) graduated from 32, 25, 19, and 13 mm in the body of the net to 6 mm in the cod end. All trawling was conducted after dark during the new moon, September 5 and 6, 1989, to optimize capture efficiency (Bowler et al. 1979). Trawling speed was 1.5 m/s. The vertical distribution of kokanee was divided into 3.5-m layers and a standard 3.5-min tow made in each layer, sampling 2,832 m^3 of water over a distance of 305 m.

To evaluate different stocking strategies, three groups of kokanee were planted into Priest Lake in 1989 (Table 1). The control group were fish from Coeur d'Alene Lake that had been reared at the Clark Fork Hatchery and were approximately 29 mm in length. This type of stocking had been used in past years. One test group of fish were from Grandby, Colorado, and were marked with tetracycline. These fish were typical size (mean 45 mm, range 32-60 mm). A second test group were exceptionally large (mean 93 mm, maximum size 130 mm) early-spawning kokanee from Deadwood Reservoir that had been reared at Mackay Hatchery, Idaho.

All groups were stocked into Priest Lake between July 6 and July 14, 1989. In the past, most kokanee had been stocked into streams draining into the lake. It was thought that some of the immediate mortality might be due to rough handling associated with stream stocking. Therefore, this year kokanee were stocked directly into the lake just before dark. Stocking took place at the Granite Creek Marina or the nearby Kaniksu Resort boat ramp. Backing the hauling truck to the water reduced the amount of head between the tank and the lake and was thought to provide for a gentler release of fish.

Results

Only two YOY kokanee were collected in Priest Lake, which made it difficult to evaluate stocking strategies. Both of the fish were from the planting of 930,000 fry from Coeur d'Alene Lake and were 55 mm and 66 mm when collected (Figure 2). Population of age 0+ kokanee was estimated at 8,300 fish $\pm$ 108% (90% error bounds). Considering 2.7 million kokanee were stocked, this translated into a survival rate of 0.3% during the first two months after stocking.

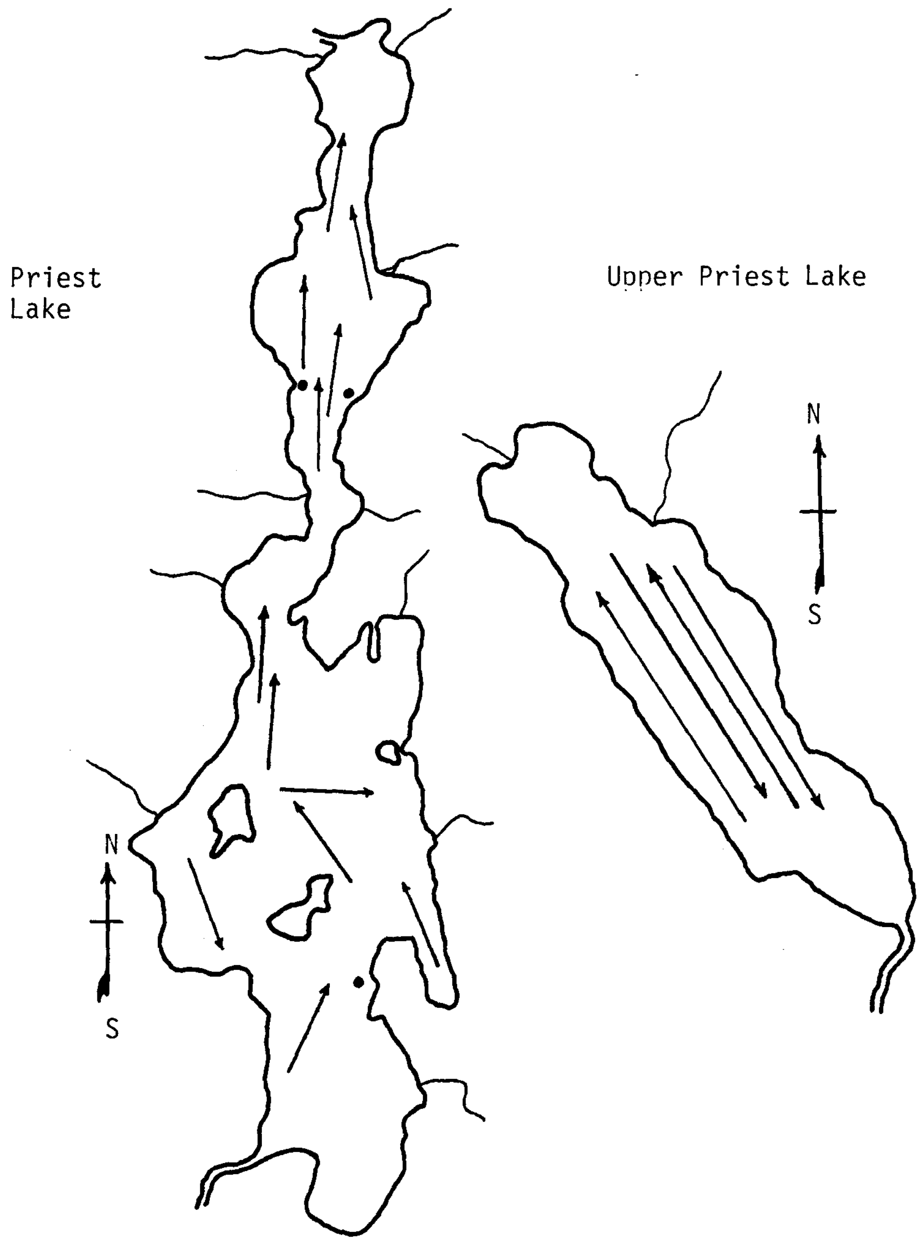

Figure 1. Location of 16 trawling sites in Priest Lake and Upper Priest Lake, Idaho. Lake maps are not drawn to scale.

Table 1. Groups of kokanee stocked into Priest Lake, Idaho, during 1989 to test survival rates.

Date stocked	Variety of kokanee	Origin	Release site	Mean length	Number of fish
7-6-89 & 7-11-89	Early spawners	Deadwood Reservoir, Idaho	Granite Creek Marina	93	192,000
7-7-89[1]	Late spawners	Granby Reservoir, Colorado	Kaniksu Resort	45	1,639,000
7-6, 12, 13, 14-89	Late spawners	Coeur d'Alene Lake, Idaho	Granite Creek Marina	29	930,000
TOTAL					2,761,000

[1]This group of kokanee were marked by feeding with tetracycline.

R189T2

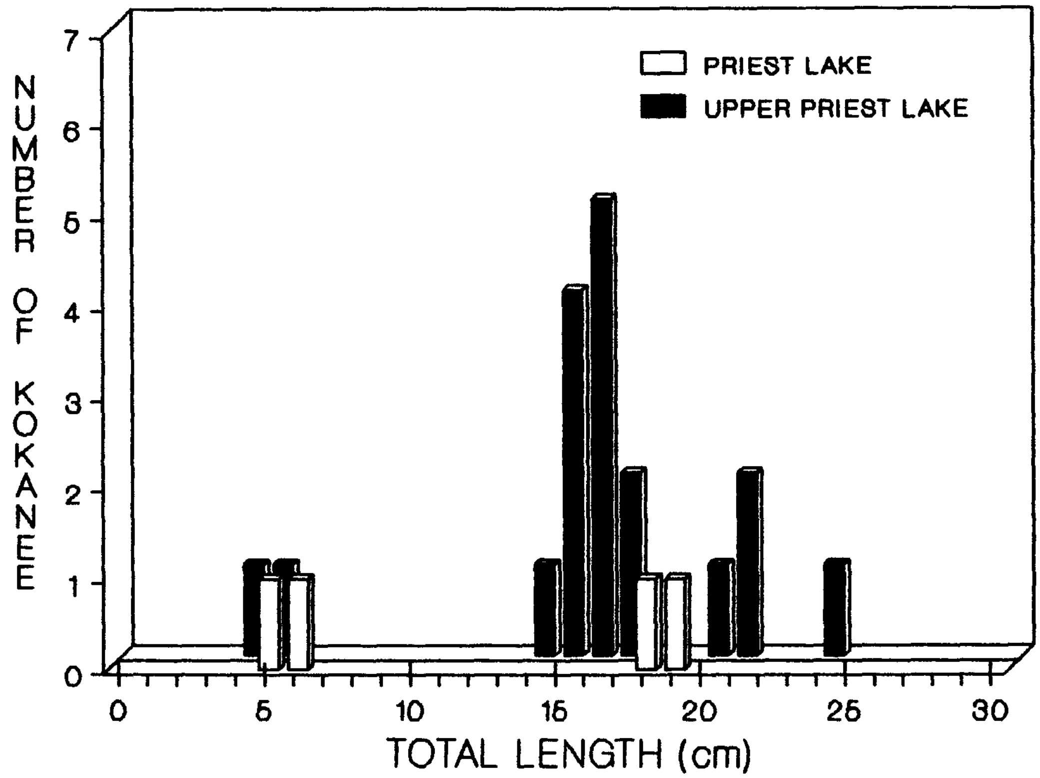

Figure 2. Lengths of kokanee caught by trawling in Priest Lake and Upper Priest Lake during September, 1989.

Priest Lake had a total estimated kokanee population of 16,600 fish; half were age 0+ and half were age 1+ (Table 2). No older age groups of kokanee were collected.

In Upper Priest Lake, a total of 1,700, 10,500, 2,600, and 900 kokanee of age classes 0+, 1+, 2+, and 3+ and 4+, respectively, were estimated in the population. Total population in Upper Priest Lake was therefore estimated at 15,700 + 75% (90% error bounds).

Discussion

Population modeling by Mauser (1988) indicated that it would require stocking from 5 to 10 million kokanee to provide a limited kokanee fishery of 1,000 to 4,000 fish annually. This stocking was deemed too expensive to justify the end result. However, he also hypothesized that stocking 3 to 5 million kokanee annually would greatly improve the mean size of lake trout (from approximately 2 kg mean size to 3.5 kg mean size). For the last several years, we have been stocking kokanee to test this hypothesis. One problem that has become increasingly apparent, however, was that kokanee survival after stocking was decreasing. The abundance of kokanee in Priest Lake has declined, even though stocking had increased (Figure 3). Our stocking this year tested several release methodologies in the hopes that one would give better kokanee survival. Unfortunately this did not happen.

Survival of kokanee fry, at 0.31 for the first two months, was exceedingly poor. This was similar to the poor stocking results in 1979 (1% survival), 1987 (0% survival), and 1988 (11 survival). Decreasing survival rates were also documented for other age classes (Figure 4). Declining survival first became apparent in older age kokanee, but now seems to have affected all age groups.

This type of progressive decline in kokanee survival was not due to stocking technique alone, since all age classes were affected. Several other explanations were possible. One would be that lake trout abundance has increased so that they are now eating virtually all available kokanee. This was supported by our creel survey interviews, which indicated the lake trout population was shifting toward more numerous, smaller fish (lower mean size but higher catch rates).

A second possibility was the Mysis shrimp have continued to increase to the point of depleting zooplankton, thus worsening kokanee survival. Since larger kokanee may be more dependent on the largest zooplankton, and since shrimp also prefer the larger zooplankton, then possibly larger kokanee were affected first. It was, however, somewhat doubtful that the shrimp could have eliminated even the smaller zooplankton utilized by small kokanee, particularly in July when the kokanee were stocked.

In either case, it appeared the conditions within Priest Lake had changed. Stocking kokanee with these rates of mortality will not accomplish our goal of providing forage for lake trout. Kokanee must grow after stocking, preferably to age 2+ or 3+, in order to gain biomass and improve

Table 2. Abundance estimates of kokanee by age class in selected north Idaho lakes, 1989. Ninety percent error bounds are given in parentheses.

Lake	Age 0	Age 1	Age 2	Age 3 and 4
Spirit Lake	120,200 (±30%)	130,500 (±65%)	223,200 (±57%)	85,800 (±39%)
Upper Priest Lake	1,700 (±92%)	10,500 (±95%)	2,600 (±102%)	900 (±160%)
Priest Lake	8,300 (±108%)	8,300 (±108%)	0	0
Coeur d'Alene Lake	3,040,00	750,000	3,950,000	940,000

R189T2

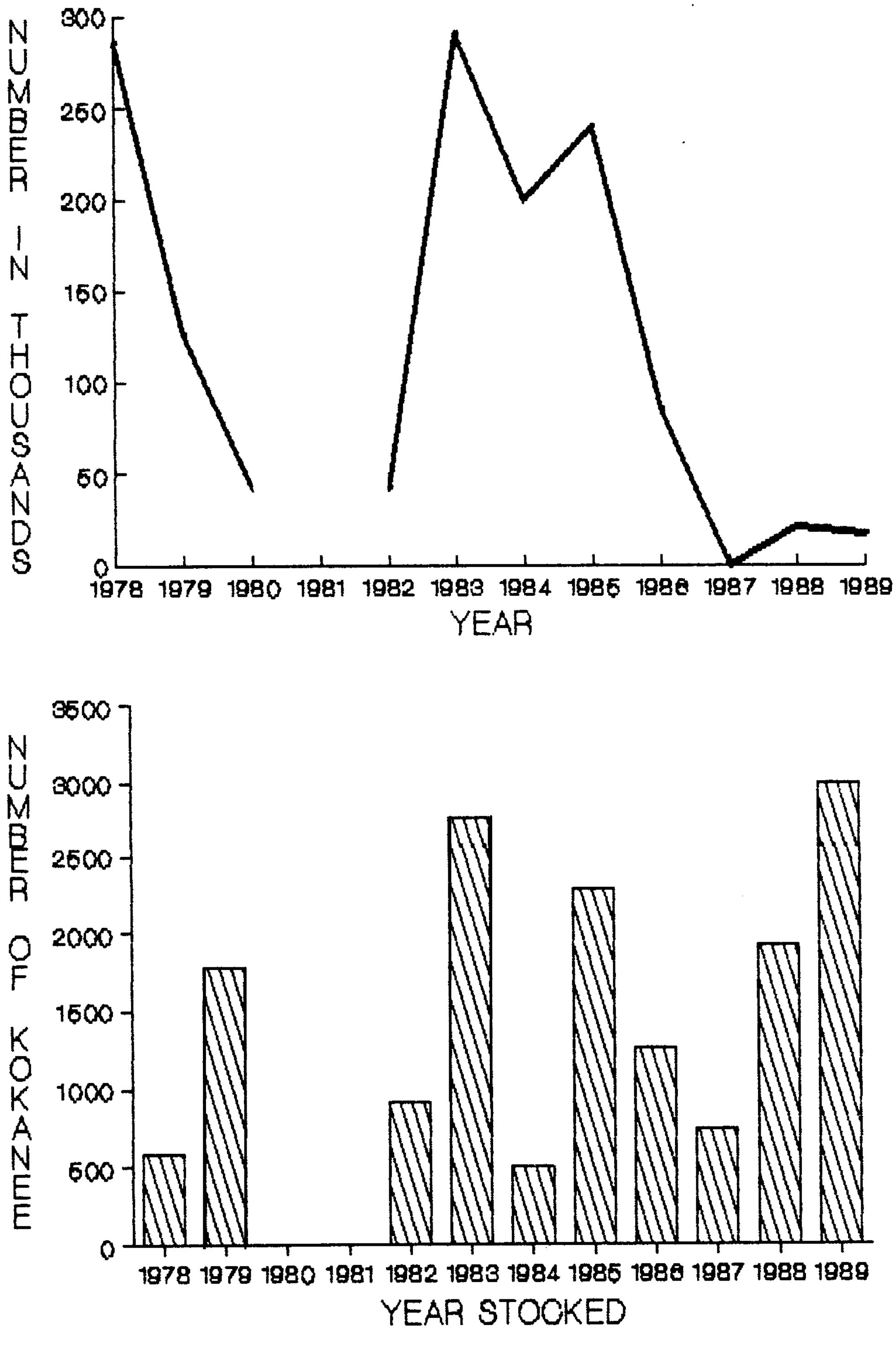

Figure 3. Kokanee abundance of all age classes (top) and number of kokanee stocked (bottom) into Priest Lake, Idaho, 1978-1989.

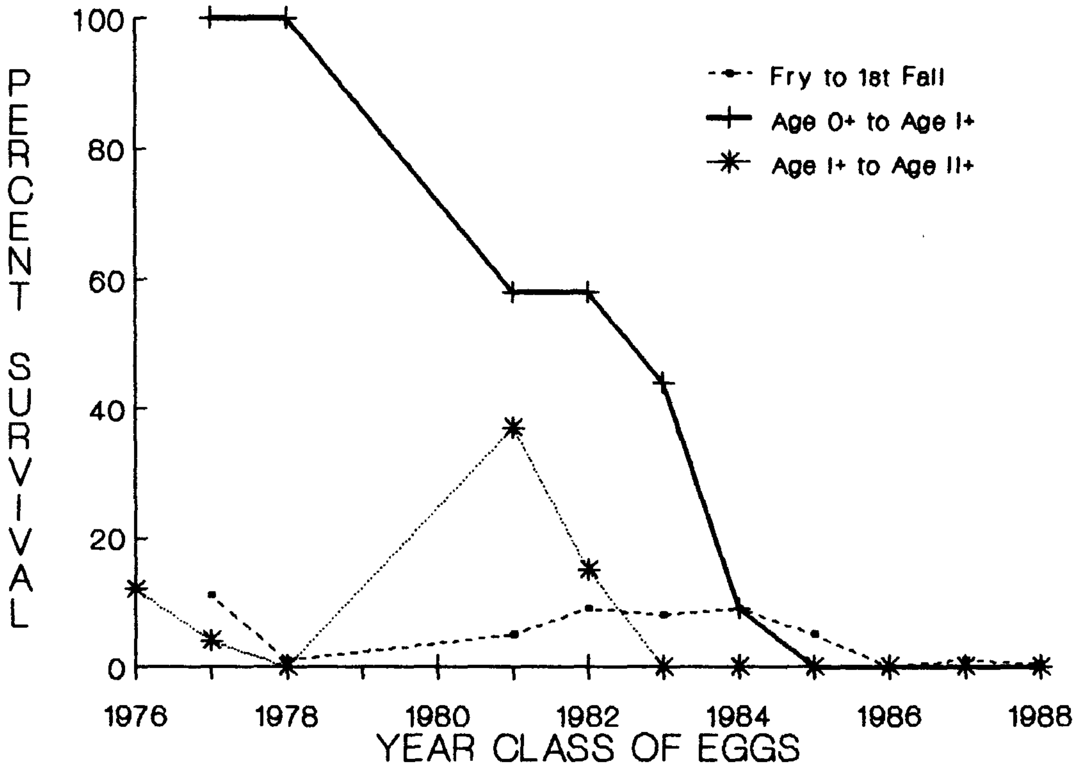

Figure 4. Survival rates for different age classes of kokanee in Priest Lake, Idaho.

the growth of larger lake trout. (With the abundant _Mysis_ population, growth of smaller lake trout needs no support.) The recommendation was, therefore, made to discontinue kokanee stocking despite strong public support for the program. If lake conditions change in the future, stocking should be reconsidered.

The situation was quite different in Upper Priest Lake. This year's population estimate of 15,679 kokanee was similar to last year's estimate of 19,200 and the previous year's estimate of 16,600. All age groups were present in the lake (Figure 2), which indicated a viable population since no stocking was conducted here. The stability and viability of this population may be due to the lower abundance (and thus less predation) of lake trout and suitable shoreline spawning conditions. Since high densities of kokanee appear to compete with cutthroat trout (which was our primary concern in managing Upper Priest Lake), no supplemental kokanee stocking was recommended (Rieman and Apperson, 1989).

Cutthroat

Anglers at Priest Lake expressed an adamant desire for a "low tech" fishery; a fishery that could be enjoyed by wives and kids with a limited amount of gear. The best fish for this type of fishing is one which already occurs in Priest Lake - westslope cutthroat. During August of 1989, 54,500 adipose fin-clipped cutthroat were stocked into the lake at Granite Creek, Coolin, Indian Creek, and Cavanaugh Bay. Fishing regulations were adopted that will permit the harvest of adipose-clipped cutthroat trout while requiring release of wild (unclipped) fish in 1990 and 1991.

Cutthroat stocking had been done in the past in an attempt to enhance the lake fishery. During the 1940s and 1950s, between 400,000 and 800,000 cutthroat were stocked annually. Bjornn (1957) estimated that only a fraction of one percent of the harvest resulted from hatchery plants. He concluded that "Barring any major changes in the numbers and distribution of fish present in the lakes and tributaries, future plants of small cutthroat will contribute little or nothing to the lake fisheries. The only possible value derived may be from the public relations standpoint."

A more recent report by Rieman and Apperson (1989) expressed similar doubts and discouraged stocking cutthroat, especially in large lakes with predators.

Mauser (1986a) did the most extensive analysis to date of cutthroat stocking in Priest Lake. Between 1981 and 1984, 869,391 two-year-old cutthroat trout fingerlings from Clark Fork Hatchery were stocked into Priest Lake. Subsequent sampling (in 1984) with purse seining, fishing, weirs, and creel census revealed that only 5Z of the 620 cutthroat trout collected were of hatchery origin. Poor overwinter survival and heavy lake trout predation were suggested as possible causes (Mauser 1986b). Hopefully, recent stocking will meet with better success. It is recommended that return-to-the-creel of future hatchery stocking be evaluated.

SPIRIT LAKE

Spirit Lake (526 ha) was a two-story fishery of both salmonids and spiny-ray fish. Kokanee and catchable rainbow trout supported most of the fishing effort. The kokanee fishery of Spirit Lake was considered to be one of the best in the region because of its high catch rates. The lake was on general regulations and open year-round. A problem with the kokanee fishery was that year class strength had been highly variable. Age 0+ kokanee abundance, as established by trawling, ranged from 3,500 in 1984 to a high of 526,000 in 1982 (Table 3). The kokanee fishery of Spirit Lake was also variable, possibly due to fluctuations in the year classes. Annual midwater trawling was conducted since 1981 to evaluate the abundance of YOY kokanee and determine the amount of fry to stock in an effort to stabilize year class strength.

Methods

Trawling methodology was the same standardized approach used in past years and described in detail by Bowles (1986). Four trawls were conducted at randomly-chosen locations during the new moon phase on July 5, 1989 (Figure 5). Trawling depths were from 5 m to 15 m. Trawls were conducted at 1.5 m/s and lasted 10.5 min at each station.

Results

The kokanee population of Spirit Lake was estimated at 559,700. Abundance estimates and 90% error bounds of age 0+, 1+, 2+, 3+ and 4+, kokanee were 120,200 (+30%), 130,500 (±65%), 223,200 (±57%), and 85,800 (±39%), respectively (Table 2). Size of the kokanee ranged from 2 cm to 26 cm (Figure 6).

Discussion

One of the main purposes of estimating kokanee abundance was to determine the amount of supplemental fry stocking needed to stabilize the population. The 1988 year class estimate (defined as eggs laid in 1988 and sampled as age 0+ fry in 1989) was moderately high. This year class (120,000) was better than the 1987 (71,000), 1986 (46,000), 1985 (17,000), and 1983 (4,000) year classes, but not as strong as the 1984 (164,000), 1982 (143,000), 1981 (526,000), or 1980 (281,000) year classes (Table 3). We therefore, recommended no stocking for 1989.

Estimating the abundance of age 0+ kokanee in Spirit Lake during July has had several problems. First, 90% error bounds on the estimates were typically rather wide. Making more hauls would help, but some of the variation was due to kokanee aggregating into certain areas. This increased the variability of the hauls and correspondingly increased the confidence interval width.

Table 3. Estimates of kokanee year classes (1977-1988) made by midwater trawling in Spirit Lake, Idaho, 1981-1989. Estimates are in thousands of kokanee.

Year Class	Year Estimated								
	198	1988	1987	1986	1985	1984	1983	1982	1981
1988	120.2[f]								
1987	130.5	71.1[a]							
1986	223.2	225.8	46.3[b]						
1985	85.8	92.4	178.7	16.6					
1984		156.3	347.5	287.3	164.4[d]				
1983			97.6	107.9	206.8	3.5[e]			
1982				56.5	113.2	17.4	143.3		
1981					74.3	160.8	272.6	526.0	
1980						103.1	146.8	209.0	281.3
1979							54.2	57.7	73.4
1978								48.0	82.1
1977									92.6
Ages I,II, III,IV	439.5	474.5	623.8	451.7	394.3	281.3	473.6	314.7	248.1
TOTALS	559.7	545.6	670.1	467.7	558.7	284.8	616.8	840.7	529.4
No./ha	977	952	1,169	816	975	497	1,076	1,467	924

Mean Number per ha = 985

[a] 75,000 kokanee fry released in 1988.
[b] 60,800 kokanee fry released in 1987.
[c] 57,142 kokanee fry released in 1986.
[d] 109,931 kokanee fry released in 1985.
[e] 100,000 kokanee fry released in 1984.
[f] No stocking recommended in 1989.

R189T2

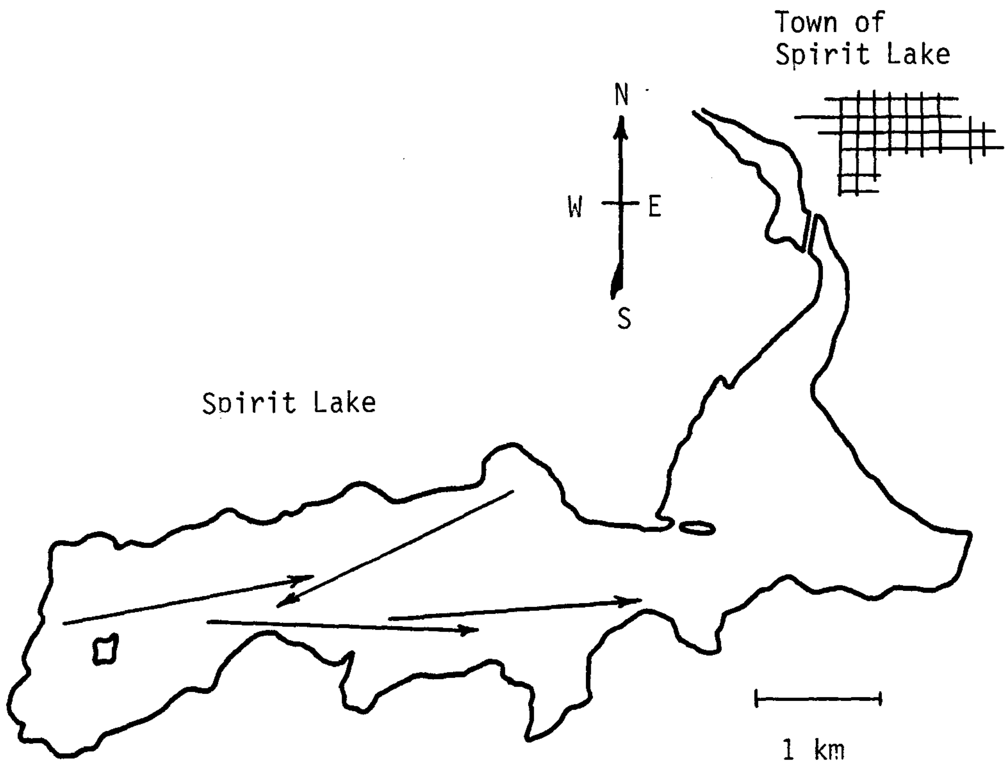

Figure 5. Location of four trawling sites in Spirit Lake, Idaho.

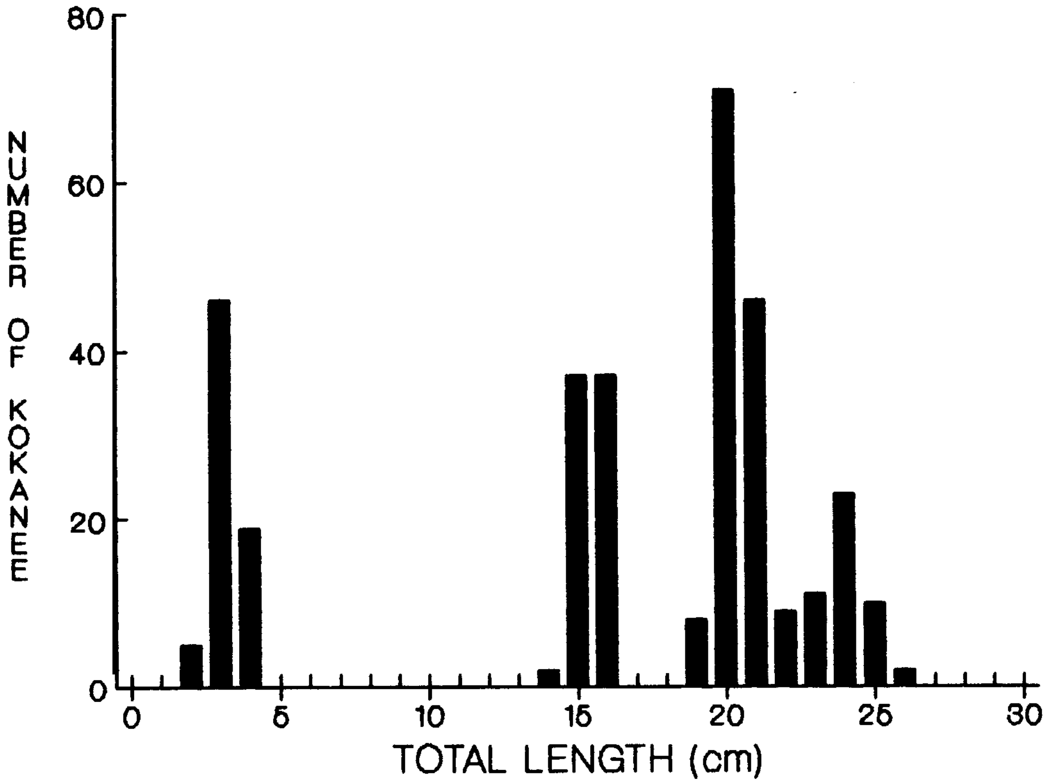

Figure 6. Sizes of kokanee in Spirit Lake, Idaho as sampled by midwater trawling during July, 1989.

A bigger problem was that for the past five years, age 0+ abundance has been underestimated. Several hauls were made near the surface and as near to shore as could safely be conducted, but YOY kokanee were not collected. Apparently, the age 0+ kokanee cohort was not completely pelagic by July. Trawling later in the year (August) was, therefore, recommended if accurate estimates are needed, but would make it more difficult to hold hatchery fish that late in the year.

The stocking of kokanee does not appear to have decreased the size of older age fish (Figure 7). Such consistency in length, even with moderate changes in density, was expected considering the mesotrophic nature of the lake (Rieman, Idaho Department of Fish and Game, personal communication).

The abundance of Spirit Lake kokanee shows an increasing trend (Figure 8). (Age 0+ kokanee were left out of the totals because of their variable nature.) Total biomass has also been increasing, particularly after 1986 (Figure 9). The increase in biomass can not be attributed solely to stocking since stocking began in 1984, and the increase in biomass was most pronounced in the last few years. A more likely cause was that the lake was becoming richer due to nutrient loading.

Next year should be a good year for the Spirit Lake fishery as another strong year class reaches age 3+. This is the second strongest year since 1981 (Figure 10).

To date, we have not determined to what extent strong and weak year classes affect the fishery. This year, anglers reported smaller fish even though fish were the same size as they have always been (Figure 6). The reason behind the complaints was that anglers were catching many age 2+ fish from this very dominant year class. Even though the density of age 3+ and 4+ kokanee was only half that of last year, catch rates remained at a respectable 1.01 kokanee harvested/hour (based on officer interviews covering 1,044 hours of fishing). This implied that good catch rates may be realized without supplemental stocking of kokanee to maximize kokanee density. We, therefore, recommend correlating catch rates and kokanee densities to determine exactly what benefits are derived by our stocking program.

The goal of the Spirit Lake trawling program was to stabilize the fishery. In Odell Lake, little relationship was observed in the stock-recruitment curve between number of spawning adults and subsequent fry production (Lewis and Lindsay 1976). Likely, a similar situation exists at Spirit Lake. Year class strength may be strongly influenced by spring weather conditions. Thus, fluctuations will continually occur. We cannot expect to even-out year classes and then have future generations be of relatively even numbers.

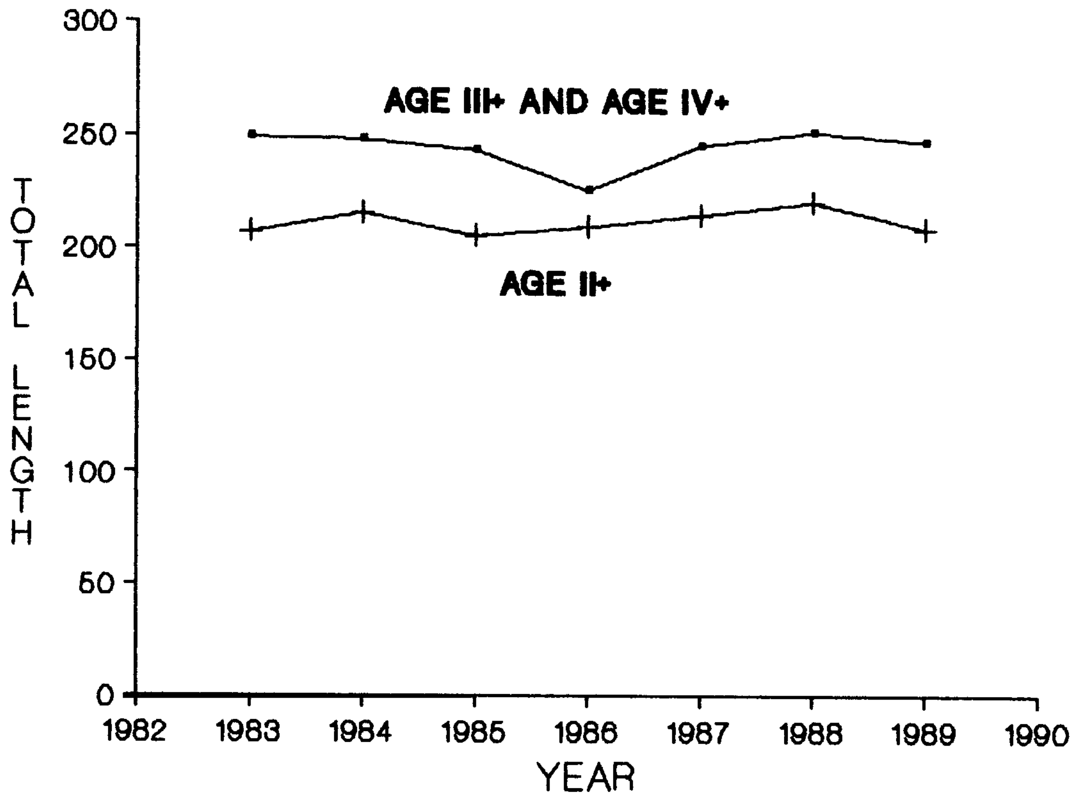

Figure 7. Mean total length (mm) of kokanee for two age groups from Spirit Lake, Idaho, 1983-1989.

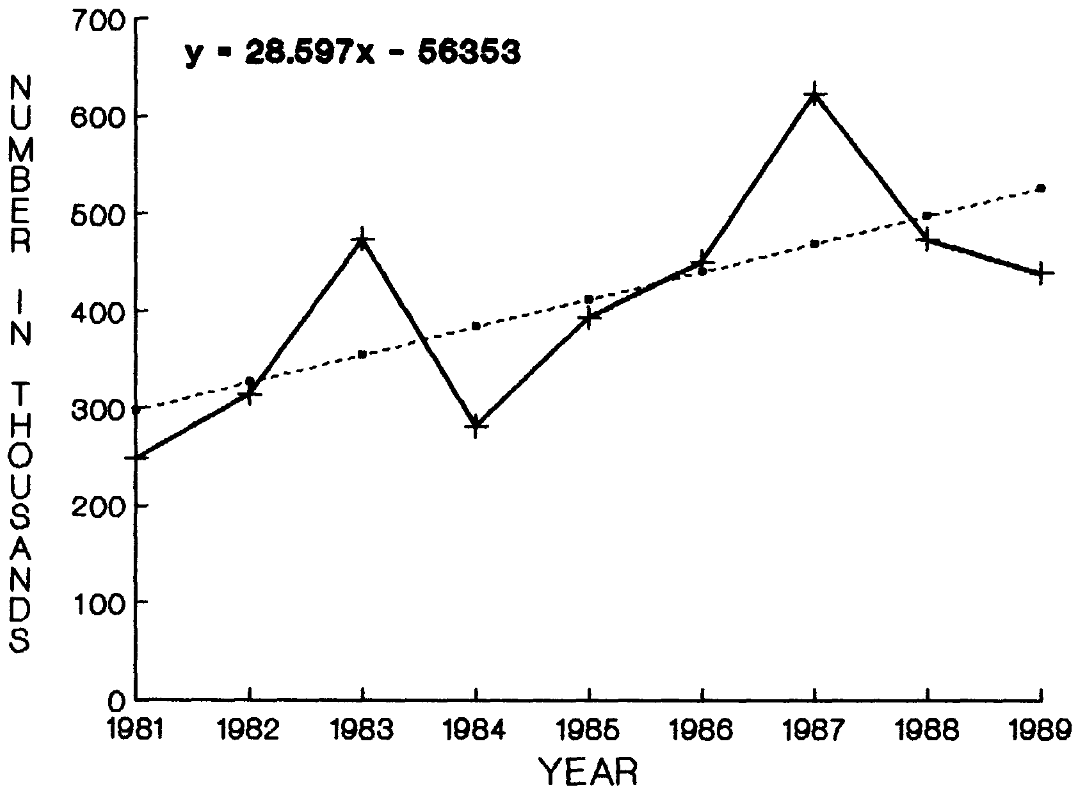

Figure 8. Estimates of kokanee abundance for fish ages 1+ through 4+ made by midwater trawling in Spirit Lake, Idaho.

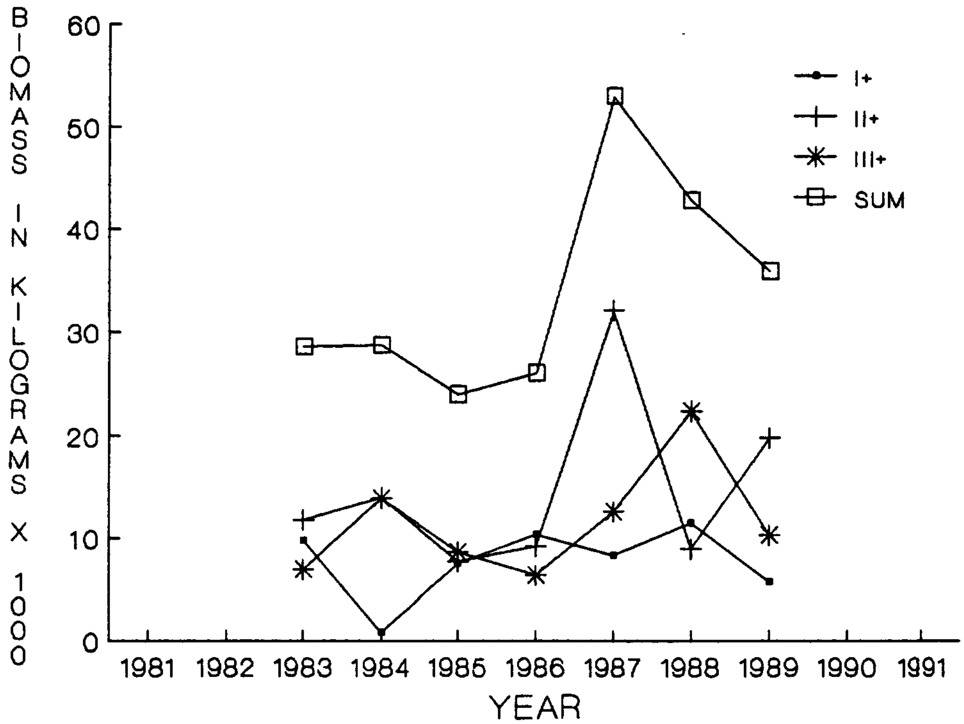

Figure 9. Biomass of different age classes of kokanee in Spirit Lake, Idaho, 1983-1989.

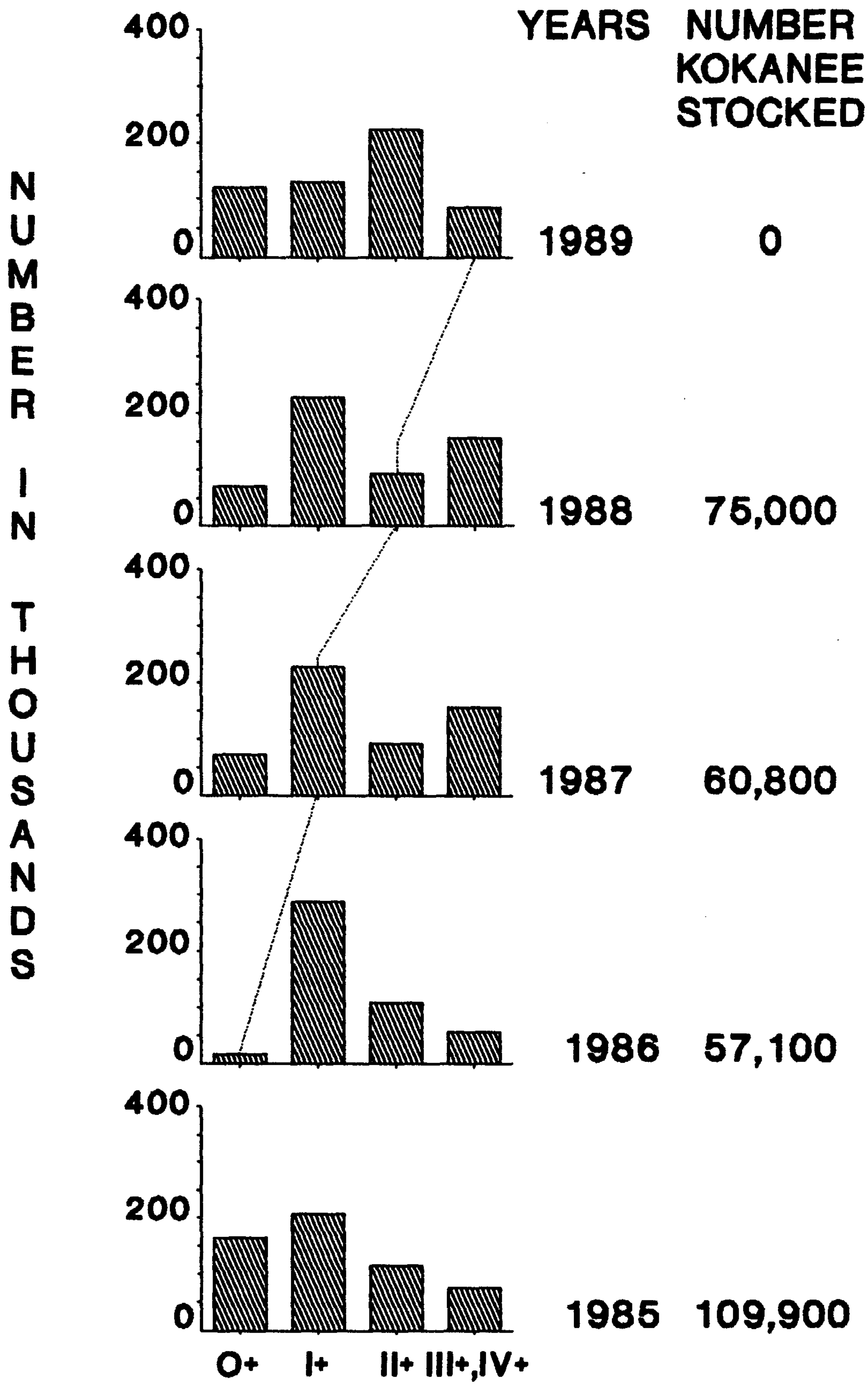

Figure 10. Year classes of kokanee in Spirit Lake, Idaho, 1985 to 1989, and the number of fry stocked that year. Dotted lines connect the 1985 year class.

LAKE PEND OREILLE

Bull Trout

Introduction

Lake Pend Oreille (38,300 ha) is the largest natural lake in Idaho, as well as the deepest (351 m). Surface elevation of the lake is regulated by Albeni Falls Dam, located on the Pend Oreille River 23 miles downstream. Kokanee moved naturally downstream from Flathead Lake, Montana, and established in Pend Oreille Lake in the 1930s. Abundant kokanee prompted the introduction of Gerrard rainbow trout in 1941, which grew to world record size by 1947. In recent years, fishing effort has been increasing, catch rates for Gerrard rainbow trout have been increasing, and trout size has been declining (Horner et al. 1988). This prompted a new regulation of one rainbow trout over 61 cm. Additional regulations to restrict bull trout harvest were modified after public hearings. Bull trout could be harvested at a rate of two per day with no size limit. These new regulations may have changed angling patterns. More fishermen were thought to target bull trout as a consumptive fishery. Our objective was to determine if this additional effort will cause overexploitation of the bull trout population.

Methods

Bull trout redd surveys have been conducted on tributaries to Lake Pend Oreille each fall since 1983 and served as an index of adult abundance (Pratt 1984 and 1985, Hoelscher and Bjornn 1988). Similar methodology was also used by Graham et al. (1980), Fraley et al. (1981), and Shepard et al. (1982). The 1989 surveys were conducted on Trestle Creek (October 3), Johnson Creek (October 16), **East** Fork Lightning Creek (October 16), Gold Creek (October 18), North Gold Creek (October 18), and Grouse Creek (October 17). These dates were consistent with the schedule used by Pratt (1985); September 20 to October 26. Redds were defined as an area of exceptionally clean gravel with a tail or mound of loose gravel downstream from a depression. In areas where redds appeared to be superimposed, the number of distinct depressions was counted. Bull trout spawning escapement was estimated by multiplying the number of redds by 3.9 fish/redd, as was used by Pratt (1984, 1985) and Hoelscher and Bjornn (1988), and calculated by Fraley et al. (1981). The entire length of creeks where redds had been reported in the past (Hoelscher and Bjornn 1988) were walked in 1989. In addition to the redd counts, creel interviews were conducted on Lake Pend Oreille. Bull trout fishermen were selectively interviewed to obtain information on catch rates and mean size of bull trout harvested.

Results

A total of 543 redds were counted in six tributaries (Table 4). Trestle Creek had the highest number of redds (217) and Johnson Creek the lowest (17). Total number of redds was up 12% from 1988-and up 20% from 1987. It is, however, lower than in 1983, 1984 or 1985 (Figure 11). Based on 3.9 fish/redd, an estimated total of 2,118 adult bull trout entered these tributaries.

One hundred forty-six bull trout anglers were interviewed during April and May 1989. They had been fishing a total of 727.3 hours. Harvest rate was 13.7 hours per bull trout, with a mean size of 551 mm (Figure 12). Largest bull trout seen in the harvest was 810 mm.

Discussion

Lake Pend Oreille was one of the few places in the state where there was still a viable bull trout fishery. It was also a popular fishery, with as many as 70 to 100 people fishing for bull trout on weekend days. Given the diminished status of bull trout populations across the state, and the fact that fishing pressure for bull trout was increasing, it was quite important to determine if bull trout were being overharvested.

We utilized three methods to indicate overharvest; redd counts, size changes in the population, and catch per unit effort.

Redd counts in Lake Pend Oreille indicated the bull trout population was stable. This year was a normal year for rainfall, and redd counts increased over the last three relatively dry years (Figure 11). Redd counts were probably one of the best indices of the adult bull trout population. It is recommended they be counted in future years.

Mean size of bull trout (551 mm) and harvest rate (13.7 hours/fish) was also consistent with past creel surveys (Figures 12 and 13). Neither of these variables has changed enough to indicate overfishing of bull trout has occurred. Thus, fishing regulations for 1990 and 1991 continued to allow for the harvest of two bull trout, any size.

HAYDEN LAKE

Introduction

Management direction for Hayden Lake has been to establish a quality fishery for both warmwater and coldwater species. Restrictive regulations were, therefore, enacted for bass, crappie, and trout. Since Hayden Lake was close to major population centers (Coeur d'Alene and Spokane), studies were conducted to determine if overexploitation of stocks was a problem.

Table 4. Number of bull trout redds counted per stream in the Pend Oreille Lake basin, Idaho, 1983-1989.

Area Stream	Total number of redds 1983[a]	1984[a]	1985[b]	1986[b]	1987	198	1989
CLARK FORK RIVER							
Lightning Creek	28	9	46	14	4		
Spring Creek	0	-	0	-	-		
East Fork	110	24	132	8	59	79	100
Savage Creek	36	12	29	-	0		
Char Creek	18	9	11	0	2		
Porcupine Creek	37	52	32	1	9		
Wellington Creek	21	18	15	7	2		
Rattle Creek	51	32	21	10	35		
Johnson Creek	13	33	23	36	10	4	17
Twin Creek		7	25	5	28	0	
NORTHERN SHORE							
Trestle Creek	298	272	298	147	230	244	217
Pack River		34	37	49	25	14	
Rapid Lightning Crk	0	-	0	-	-		
Grouse Creek	2	108	55	13	56	24	50
Hellroaring Creek	0	-	4	-	-		
Jeru Creek	0	-	0	-	-		
EASTERN SHORE							
Granite Creek	3	81	37	37	30		
Sullivan Springs	9	8	14	-	6		
North Gold Creek	16	37	52	8	36	24	37
Gold Creek	131	124	111	78	62	111	122
TOTALS OF THE SIX STREAMS COUNTED IN 1989	570	598	671	290	453	486	543

[a]Data from Pratt 1985
[b]Hoelscher and Bjornn 1988

R189T2

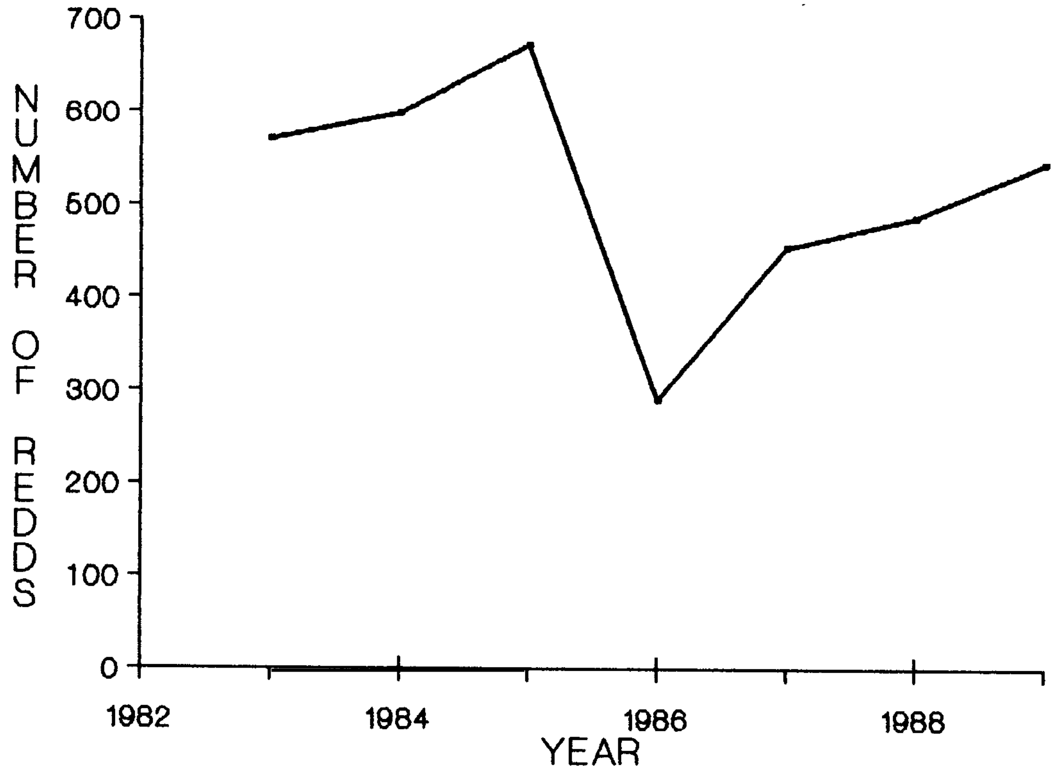

Figure 11. Total number of bull trout redds counted in East Fork of Lightning Creek, Johnson Creek, Trestle Creek, Grouse Creek, North Gold Creek, and Gold Creek, tributaries of Lake Pend Oreille, Idaho, 1983 to 1989.

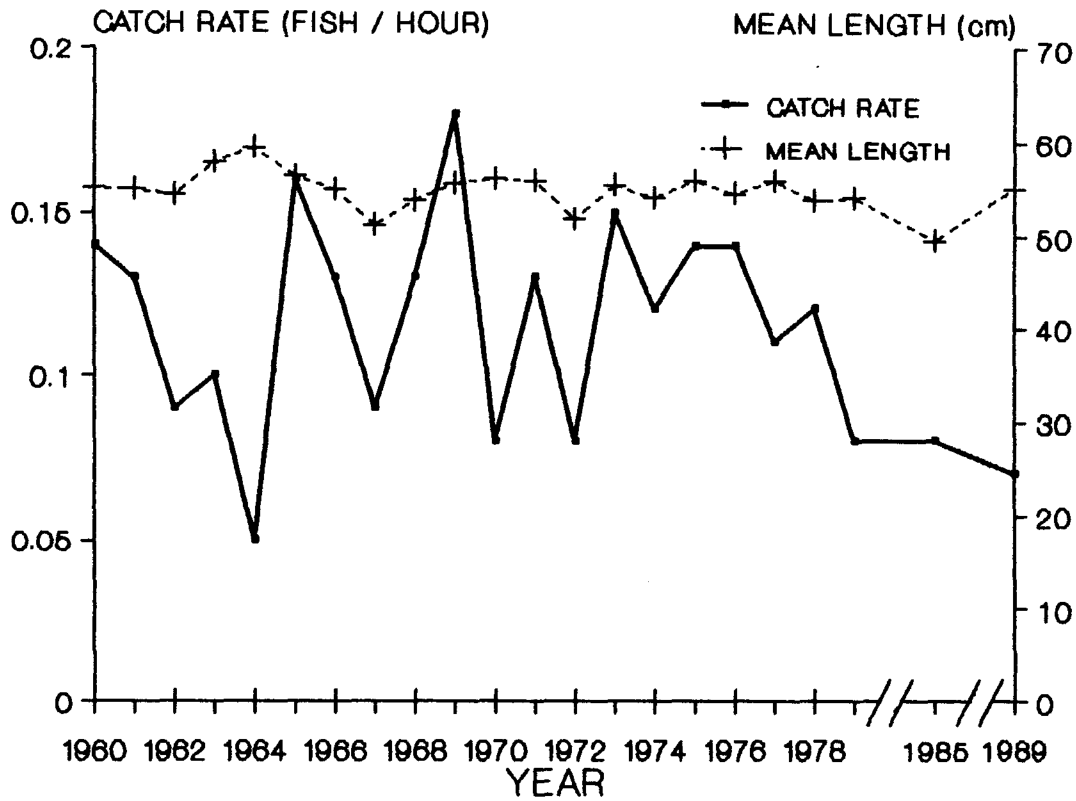

Figure 12. Bull trout harvest rates and mean sizes from Lake Pend Oreille, Idaho.

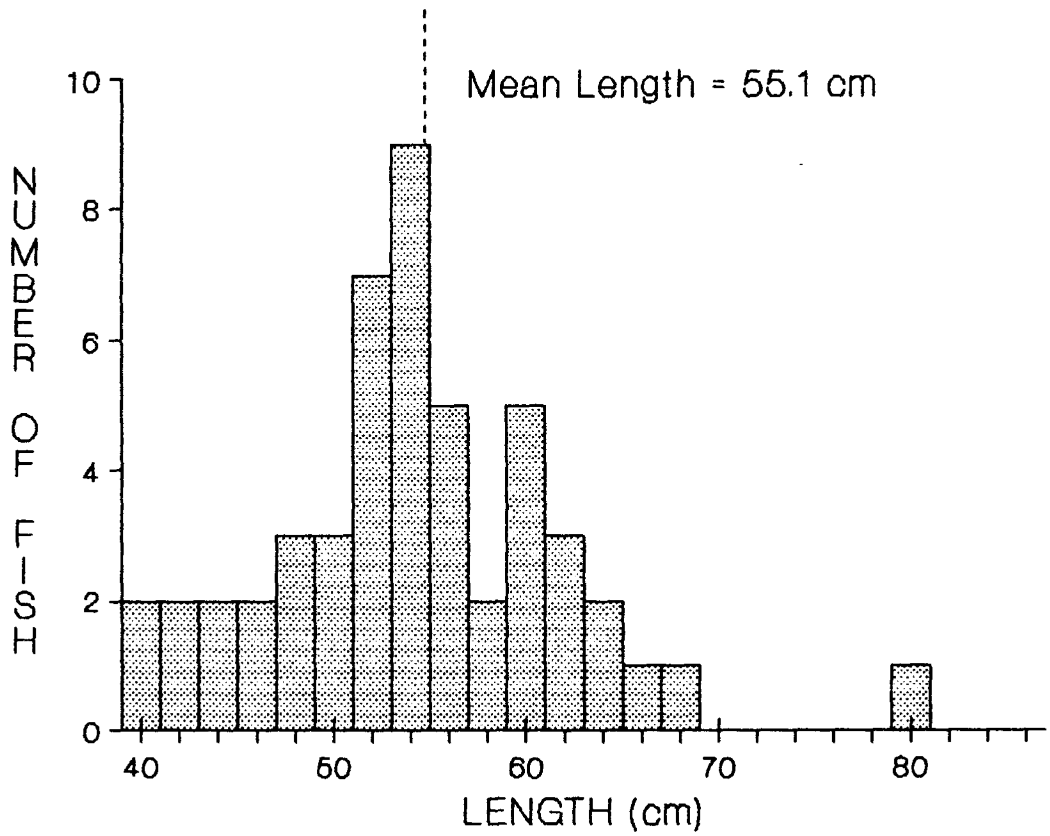

Figure 13. Sizes of bull trout in anglers' creels from Lake Pend Oreille during April and May 1989.

Methods

On May 22 and June 7, 1989, Hayden Lake was electrofished to determine the size frequency of bass and crappie. Sampling was done during the largemouth bass spawning season. All bass and crappies were measured, and $5 reward tags (Floy type) were inserted into the dorsal musculature of 23 legal size largemouth bass (>36 cm).

During the summer (June 1 to July 31, 1989), creel surveys were conducted, particularly to gather completed trip information from crappie anglers. Number of fish caught, hours per trip, and size of fish were recorded.

Results

Numerous largemouth bass up to 46 cm were collected. Size frequency distribution (Figure 14) did not indicate cropping of older age fish. None of the 23 reward tags were returned to the Department office. Good numbers of smallmouth bass were collected, but none were over the legal size limit of 36 cm (Figure 14).

Twenty-eight anglers were interviewed after fishing trips for crappies. Crappies in anglers creel were larger than those electrofished, with 64% of the total over 254 mm (Figure 15). A total of 51.5 hours were fished to catch 29 crappies for a catch rate of 0.56 fish/h. Average length of harvested crappies was 26 cm, and the average catch/trip was one fish. No anglers caught more than ten fish.

Discussion

Largemouth bass do not appear to be overharvested in Hayden Lake, since a high proportion of the population was legal size bass. (Electrofishing is, however, selective towards larger size fish, and sampling was during spawning time, which also made big fish more vulnerable.) The lack of exploitation was also indicated by the fact that no reward tags were returned.

Two hundred fifty smallmouth bass were first released into Hayden Lake in 1983. Forty-four were from Dworshak Reservoir and 206 from the Snake River in Washington (Rieman 1984). An additional 2,050 and 4,000 smallmouth bass fingerlings were released in 1985 and 1986, respectively. Electrofishing this year was conducted to determine the status of the population. Of the bass collected by electrofishing, none have reached the legal minimum size length. But, the bass in the population did appear to be getting larger. LaBolle (1988) electrofished Hayden Lake in 1987. Most bass at that time were under 25 cm, and the modal size of larger size group was about 19 cm. This compares to a maximum size of about 30 cm and a modal size of about 25 cm. This indicates that a segment of the population has increased 6 cm in the last two years.

R189RPT

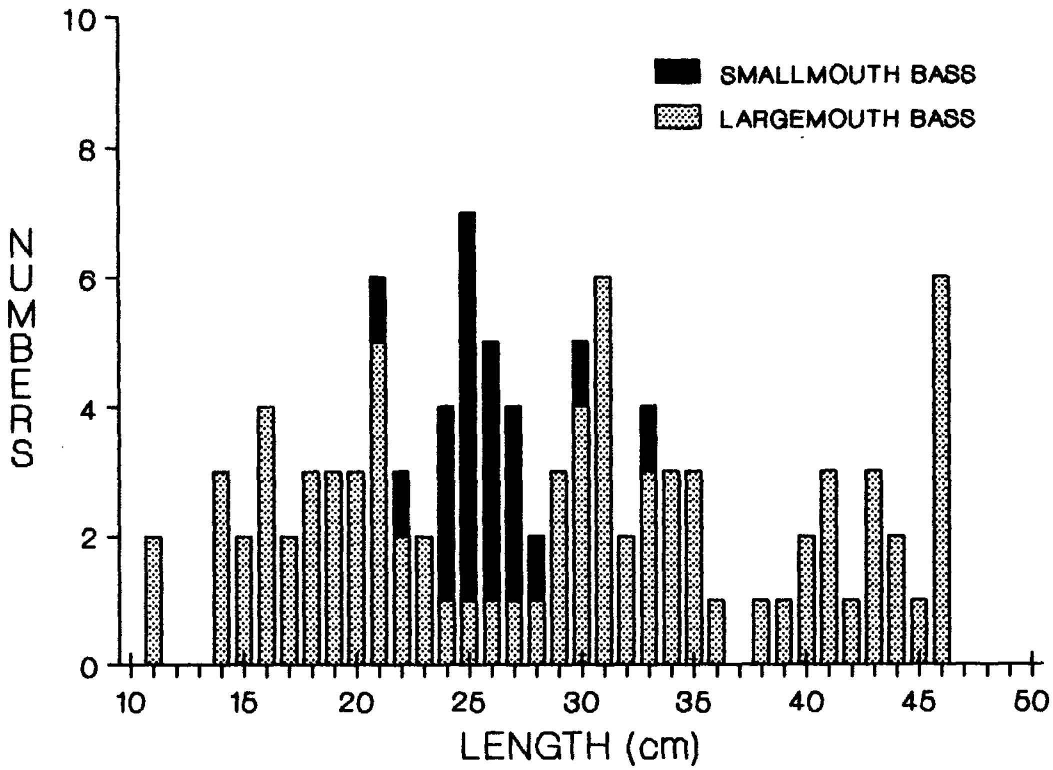

Figure 14. Sizes of largemouth and smallmouth bass collected in Hayden Lake, Idaho, by electrofishing, May and June, 1989.

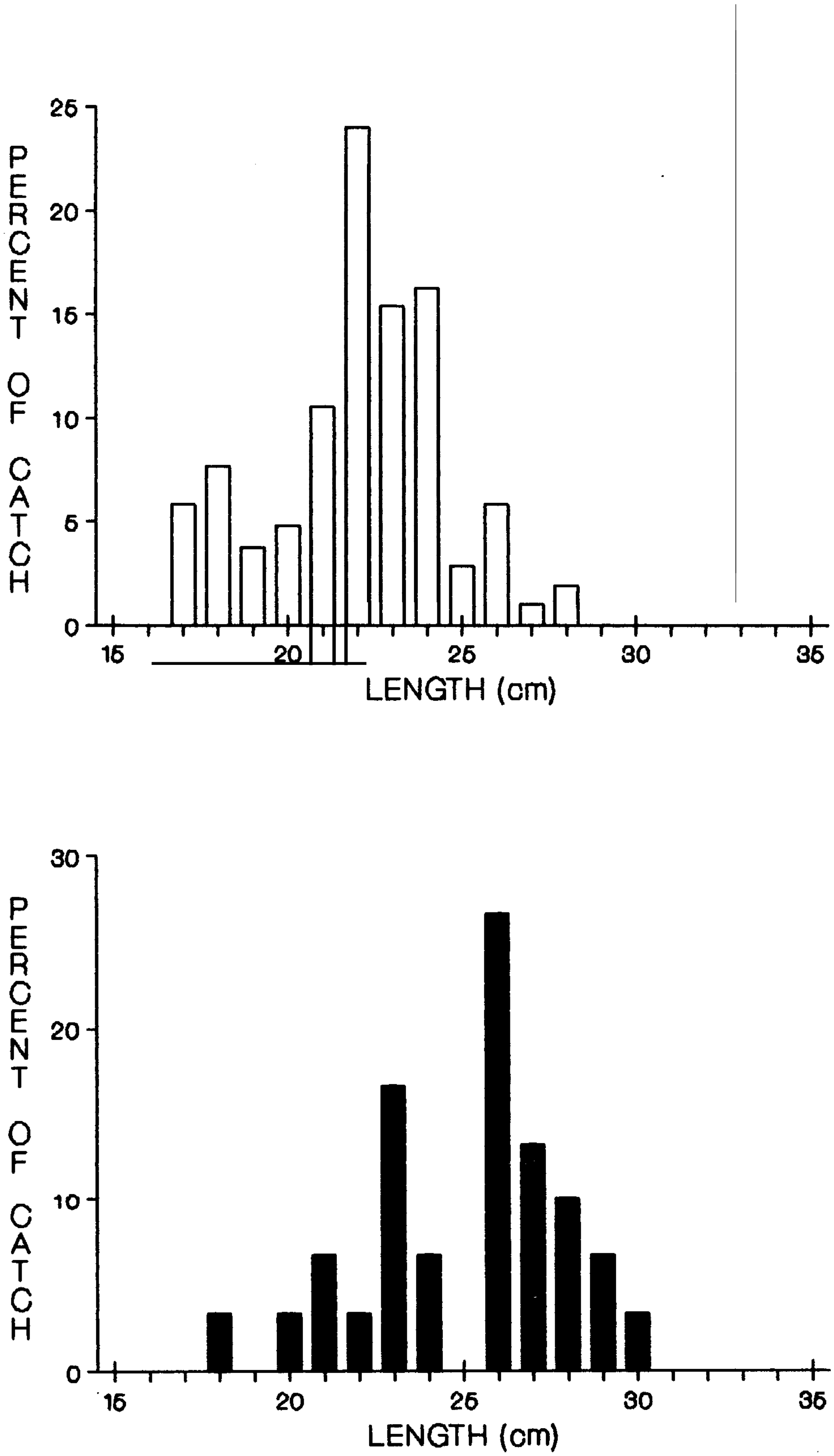

Figure 15. Length of crappies from Hayden Lake as collected by electrofishing (top) and anglers (bottom), 1989.

The summer of 1989 was not a good season for crappie fishing in Hayden Lake. With an average harvest rate of one fish/trip, it was difficult to believe fishermen could affect crappie population structure. However, crappie fishing was typically best in the spring and may have been missed by the creel survey. During spring and summer, crappies congregate in shallow bays and under docks around the lake and are typically quite vulnerable. Knowledgeable anglers have reported that the mean size of crappies was declining.

Starting in 1990, a regulation of 15 crappies none under 25 cm will be in effect. This could effectively reduce harvest in 1990 by 46% based on this year's size in the creel (Figure 15). During years beyond 1990, the increased survival of crappies under 25 cm will allow more fish to enter the larger size classes, and may even increase the kilograms of crappies harvested.

COEUR d'ALENE LAKE

Fall Chinook Salmon and Kokanee

Introduction

Coeur d'Alene Lake (12,743 ha) lies adjacent to the town of Coeur d'Alene and, as such, is a popular urban fishery. Kokanee were stocked into the lake from 1937 to 1974, until it was determined the population was self-sustaining. With the construction of Interstate 90 along the north shore of Wolf Lodge Bay and establishment of good shoreline spawning beds, kokanee density increased until size of mature fish averaged less than 25 cm in length. Fall chinook salmon were stocked into the lake in 1982 in an attempt to reduce the kokanee population and allow kokanee to grow larger while providing a limited trophy fishery. With the stocking of chinook, a very popular salmon fishery has developed. The salmon fishery has been increasing in economic and social importance to the local communities. The populations of both kokanee and chinook were monitored to determine their status and to attempt to provide a balanced fishery.

Methods

Kokanee Trawling-Kokanee abundance was estimated using standardized trawling methods and statistical analysis as described by Bowles 1987. Seventeen trawls were conducted at standardized locations as in past years (Figure 16). Depths ranged from 1.8 m to 21.8 m. All trawling was conducted at night during the new moon, August 2-4, 1989. The vertical distribution of kokanee was divided into 3.5-m layers, and a standard 3.5-min tow at 1.5 m/s was made in each layer. (See Priest Lake Methods, this report).

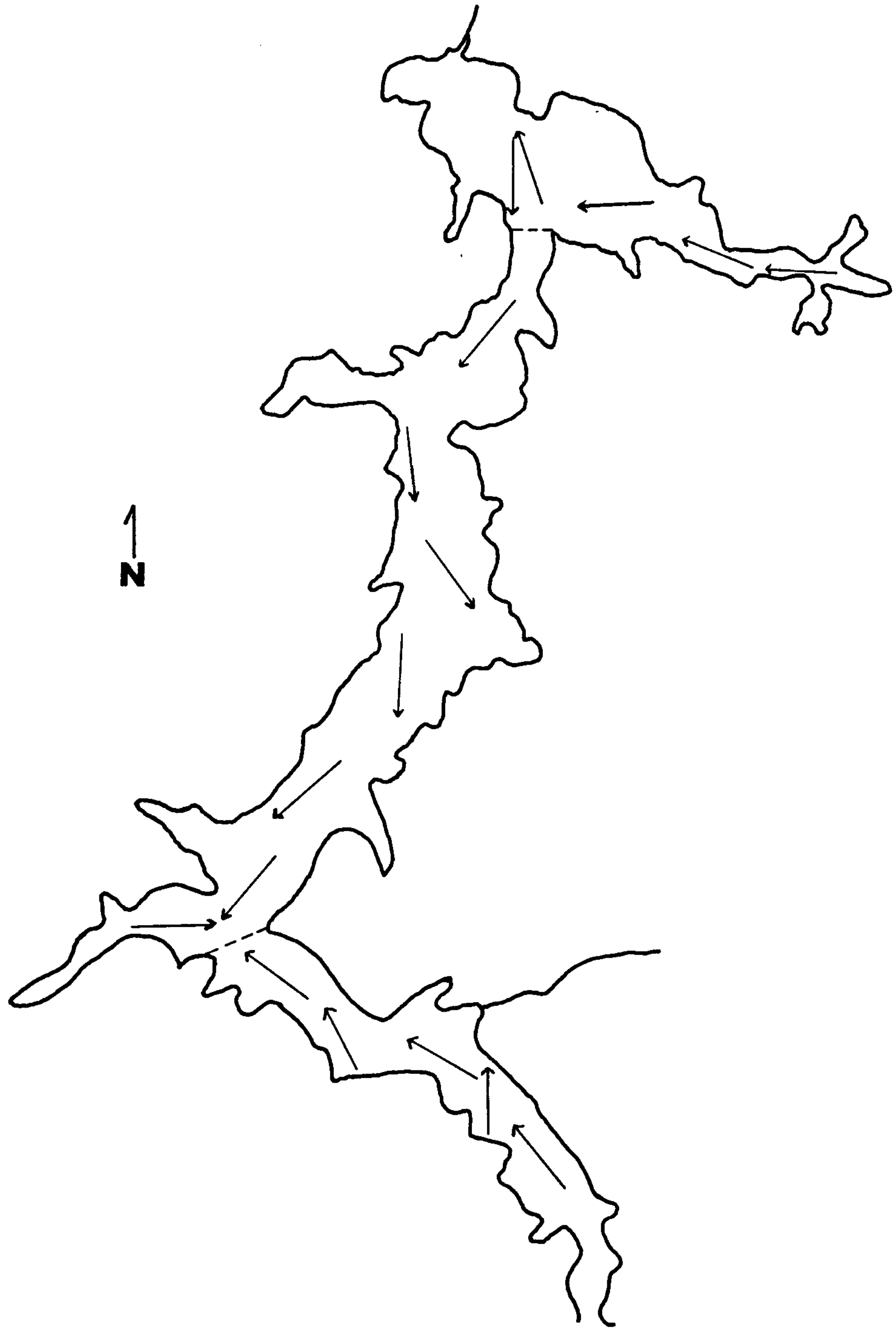

Figure 16. Location of 17 trawling sites in Coeur d'Alene Lake, Idaho. Transect lengths not drawn to scale.

Kokanee Trapping-Two Lake Merwin trap nets were set in Coeur d'Alene Lake to catch mature kokanee for our spawntaking operation; one at the mouth of Beauty Bay, the other due east of the Interstate 90 boat ramp. Samples of male and female kokanee were measured, and females were dissected to determine the number of eggs left in the body after being spawned. The average number of eggs spawned per female was determined from estimates of the egg take on a given day divided by the number of females spawned. Potential egg deposition (PED) was calculated by multiplying the mean number of eggs/female times the number of mature female kokanee in the lake (based on trawling) and adding the number of eggs taken during the spawning operation.

Chinook Stocking-The population of chinook salmon has been supported by stocking each year since 1982, and 1989 was no exception (Table 5). One release of 35,400 Coeur d'Alene stock fall chinook post-smolts was made on July 6, 1989. Fish averaged 126 mm, and most ranged from 100 mm to 165 mm (Figure 17). Examination of the post-smolts at the time of stocking revealed a 97% efficiency of the right ventral fin clip. These fish were hatched from eggs collected from Wolf Lodge Creek during October 1988. These eggs were taken from the early part of the run and, thus, favored the Bonneville stock of chinook salmon. During snorkeling surveys on July 7, only 29 chinook mortalities were found.

Chinook Trapping-Adult chinook were trapped in Wolf Lodge Creek by placing a weir under the Interstate 90 frontage road bridge. Trapping efficiency was greatly improved by using a new fyke made of cedar slats. Because of the new fyke, no gillnetting below the trap was needed to collect and trap shy fish.

Numbers of wild and hatchery (fin-clipped) chinook were recorded. Chinook were also measured, weighed, and aged by otoliths.

Chinook Creel Survey-Creel surveys were conducted during the "Big One" chinook derby to determine catch rates and to document presence of wild and hatchery fish.

In addition, creel surveys were conducted on Coeur d'Alene Lake between May 21 and August 24, 1989. Counts of anglers and interviews were conducted to determine fishing pressure, catch rates, and total harvest.

Results

Kokanee Population Status-Estimated abundance of kokanee of ages 0+, 1+, 2+, 3+, and 4+ was 3.04 million, 0.75 million, 3.95 million, and 0.94 million, respectively (Table 6).

Male kokanee during the spawntaking operation averaged 237 mm (n=54, s=14.8) and females averaged 232 mm (n=44, s=10.6). We estimated the lake

Table 5. Number, pounds, and length of fall chinook salmon released into Coeur d'Alene Lake, Idaho, during 1982-1989.

Release date	Release location	Number released	Pounds released	Length (mm) Mean	Range	Rearing hatchery	Stock of fish	Comments
07/19/82	Mineral Ridge boat ramp	28,700	1,688	137	125-150	Hagerman	Bonneville	
10/05/82	I-90 boat ramp	5,700	600	150	130-170	Hagerman	Bonneville	
TOTAL 1982	34,400	2,288						
08/09/83	I-90 boat ramp	30,100	636	109	80-130	Mackay	Bonneville	
10/26/83	I-90 boat ramp	30,000	1,402	124	80-150	Mackay	Bonneville	
TOTAL 1983	60,100	2,038						
10/29/84	I-90 boat ramp	10,500	820	150	80-190	Mackay & Mullan	Lake Michigan	
10/16/85	I-90 boat ramp	11,100	900	13	100-110	Mackay & Mullan	Lake Michigan	Left vent. clip
10/17/85	I-90 boat ramp	7,400	600	143			Lake Michigan	Adipose fin clip
TOTAL 1985	18,500	1,500						
07/02/86	I-90 boat ramp	29,500	825	114	81-145	Mackay	Lake Michigan	Right vent. clip
07/01/87	I-90 boat ramp	59,400	1,980	119	62-155	Mackay	Lake Michigan	Adipose clip
07/16/88	I-90 boat ramp	44,600	2,150	133	95-180	Mackay	Lake Michigan	Left vent. clip
07/06/89	I-90 boat ramp	35,000	1,400	126	100-165	Mackay	Coeur d'Alene	Rt. vent clip

R189T1

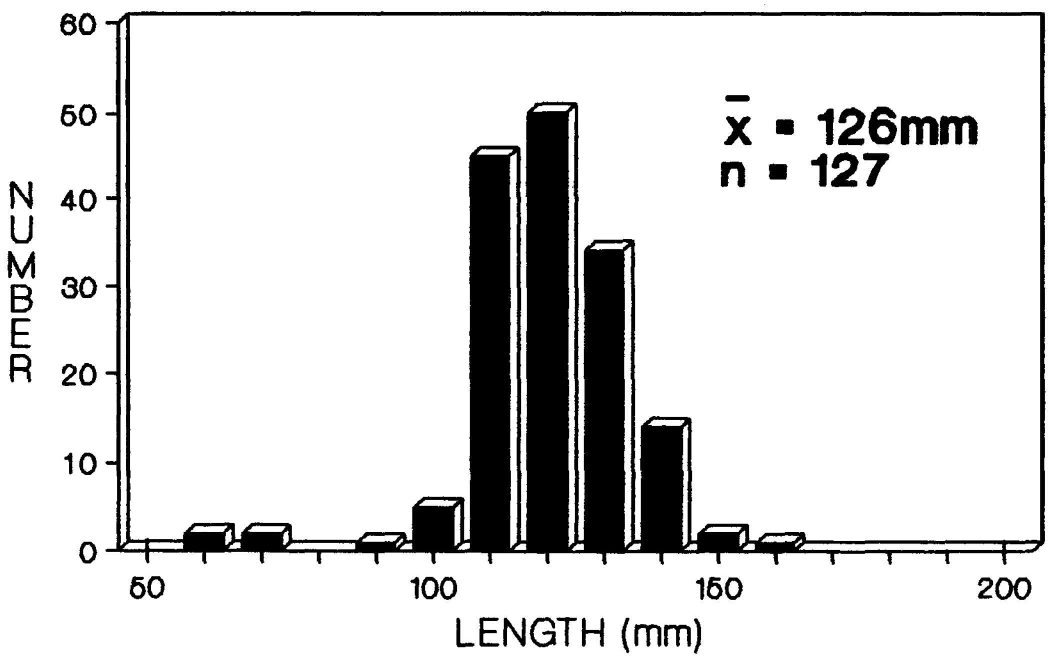

Figure 17. Length frequency of fall chinook salmon juveniles released into Coeur d'Alene Lake, Idaho, July 6, 1989.

Table 6. Estimates of kokanee year classes (1975-1988) made by midwater trawling in Coeur d'Alene Lake, Idaho, 1979-1989. Estimates are in millions of kokanee.

Year[1]	Year Estimated										
Class	1989	1988	1987	1986	1985	1984	1983	1982	1981	1980	1979
1988	3.04										
1987	0.75	3.43									
1986	3.95	3.06	6.88								
1985	0.94	3.81	2.38	2.17							
1984		0.61	2.92	2.59	4.13						
1983			0.89	1.83	0.86						
1982				0.72	1.86	0.70					
1981					2.53	1.17	1.51				
1980						1.89	1.91	4.53			
1979						0.80	2.25	2.36	2.43		
1978							0.81	1.38	1.75	1.86	
1977								0.93	1.71	1.68	1.50
1976									1.06	1.95	2.29
1975										1.06	1.79
											0.45
TOTAL	8.68	10.90	13.07	7.31	9.37	4.56	6.48	9.20	6.94	6.55	6.04
No./ha	900	1,123	1,353	757	970	472	671	953	719	678	625

[1]Year eggs were deposited.

R189T2

contained 939,718 mature kokanee, and that 55% of these were females containing 300 eggs each. Thus, potential egg deposition was estimated at 155 million (Table 7).

Creel survey indicated 29,087 hours were spent kokanee fishing on the north end of Coeur d'Alene Lake between May 21 and August 24.

Chinook Population Status-Approximately 160 chinook spawners entered Wolf Lodge Creek during September and October of 1989. The cedar slat fyke design was very effective at catching and keeping chinook in the trap. A total of 133 fish (64 females and 69 males) were spawned, and 210,000 eggs were collected. An average of 4,375 eggs were collected per female.

The chinook spawning run had a bimodal distribution of wild and hatchery fish (Figure 18). Wild fish migrated between September 14 and October 9, with the peak about September 25. Hatchery fish started migrating about September 29 and continued until October 18, with the peak catch on October 12.

Between May 21 and August 24, 1989, an estimated 37,363 hours of chinook fishing occurred north of Arrowpoint on Coeur d'Alene Lake. An average of 44.3 hours were expended per chinook caught during this time interval, and an estimated 843 chinook were harvested (Table 8). Catch rates for chinook were the second best on record and only exceeded by those in 1987 (Figure 19).

The length-weight relationship for chinook during 1989 was described by the equation $W = 1.28 \times 10\text{-}5\ L^{3.01,}$ $r^2 = 0.96$ (Figure 20).

Discussion

Chinook-Kokanee Interaction-The original intent of chinook stocking was to increase kokanee size by reducing their numbers and allowing further growth. This has not occurred. Age 3+ kokanee continued to average 23 to 24 cm in length, and mature kokanee this year were smaller than any time since 1983 (Figure 21). Chinook were, however, having an effect on kokanee. Survival of kokanee from age 2+ to 3+ has declined from 572 (1979 to 1983) to 26% (1987 to 1989)(Figure 22). Survival of age 0+ to age 1+ kokanee has also been declining over the last five years (Figure 22). Increased predation on kokanee in their last year of life does little to increase their final size because most of the fish's energy goes to production of gametes. The implication of this finding was that a smaller predator (eating smaller prey) would be better at improving kokanee size. This was contrary to current management of stocking longer-lived (thus larger) chinook.

The declining survival of age 0+ to 1+ kokanee was also alarming. Normally, survival was 70% to 90% for this age group, but dropped to 21% during 1988-1989. This resulted in the lowest estimate of age 1+ fish on record (from a relatively good year class as age 0+) (Table 6). This

Table 7. Estimates of female spawning escapement, potential egg deposition, fall abundance of wild kokanee fry, and their subsequent survival rates in Coeur d'Alene Lake, Idaho, 1979-1989.

Year	Estimates			
	Female spawn escapement	Potential no. eggs ($x10^6$)	Fall fry from prev. yr. escpt. ($x10^6$)	Wild survival (%)
1979	256,716	86	--	--
1980	501,492	168	1.86	2.2
1981	550,000	184	2.43	1.45
1982	358,200	120	4.54	2.46
1983	441,376	99	1.51	1.25
1984	316,829	106	0.70	0.71
1985	530,631	167	4.13	3.90
1986	368,633	103	2.52	1.51
1987	377,746	126	7.11	6.90
1988	357,788	117	3.63	2.88
1989	516,844	155	3.04	2.60

R189T2

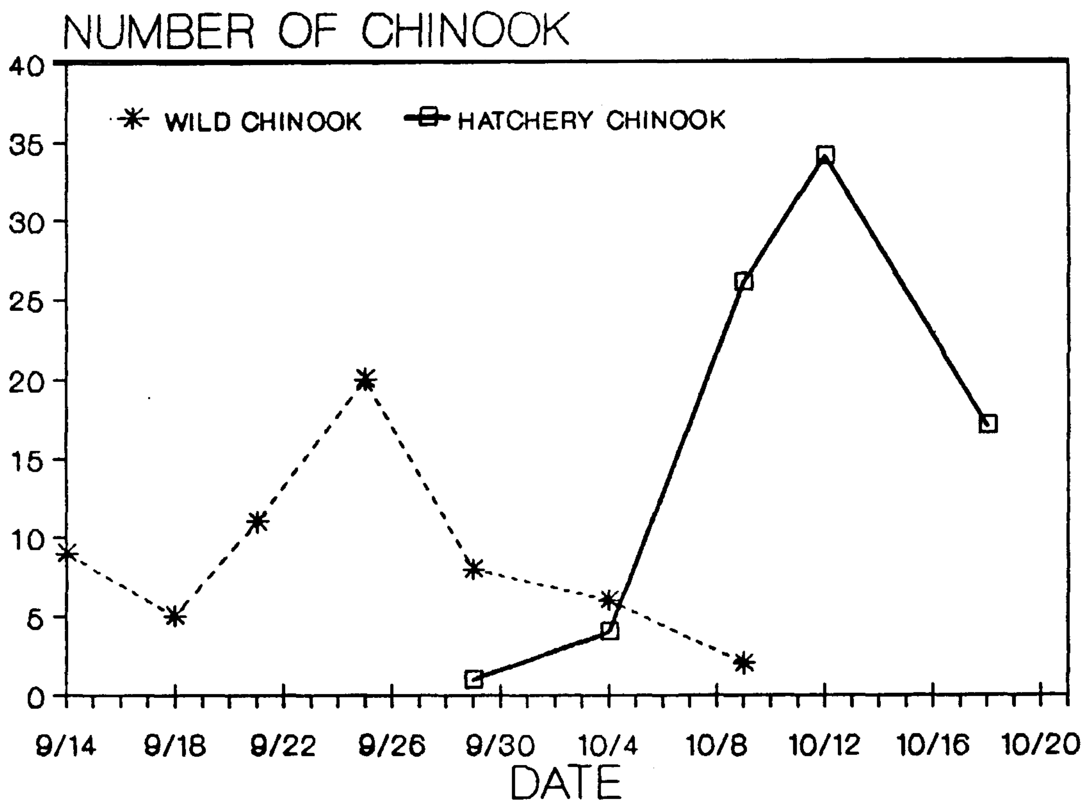

Figure 18. Number of fall chinook collected in the Wolf Lodge Creek trap during the spawning run, 1989.

Table 8. Estimated effort on the north end of Coeur d'Alene Lake, Idaho, May 21 through August 24, 1989, and estimated catch rate and harvest of chinook, kokanee, and other fish.

Anglers interviewed	Average angler count	Estimated effort (hours)	Hours expended for species		Catch rate (fish/hour)		Estimated harvest
604	43.1	69,792	Chinook	37,363	Chinook	44.5[b]	843
			Kokanee	29,087	Kokanee	1.11	32,287
			Other[a]	3,342	Other[a]	0.48	1,604[a]

[a]Includes both spiny-ray fish and cutthroat trout.
[b]Chinook catch rates reported as hours per fish.

R189T1

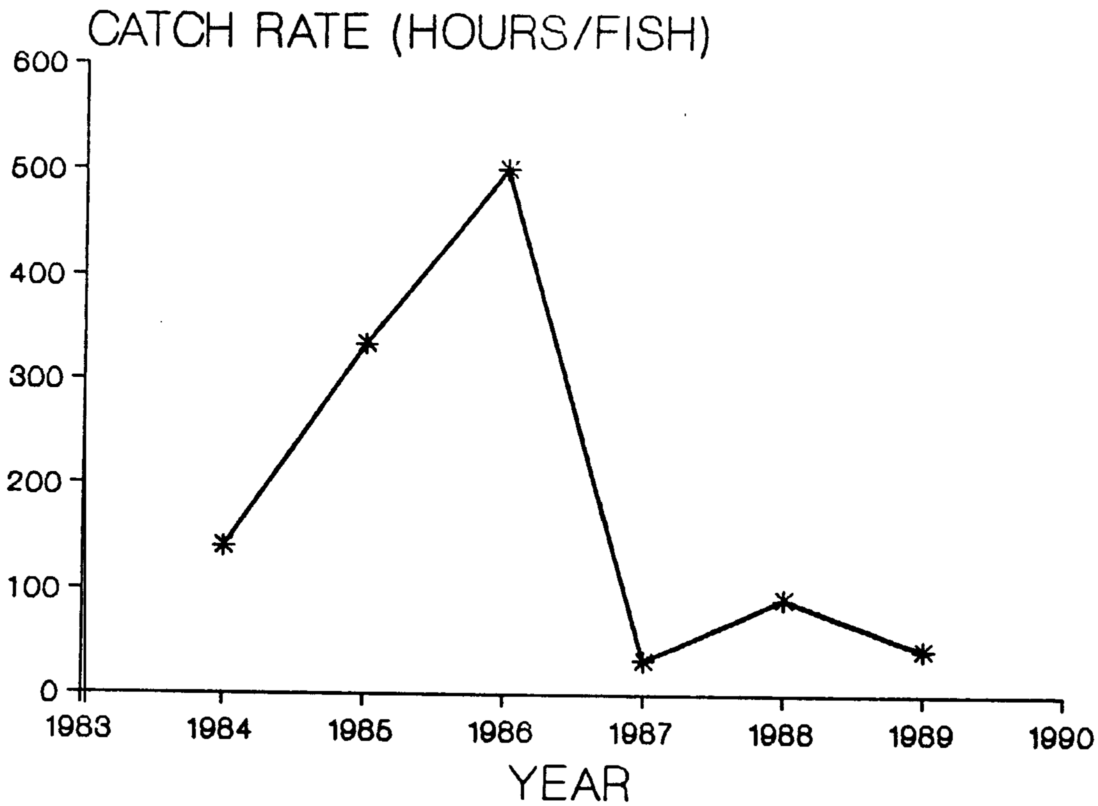

Figure 19. Estimates of chinook catch rates in Coeur d'Alene Lake, Idaho, 1984 to 1989.

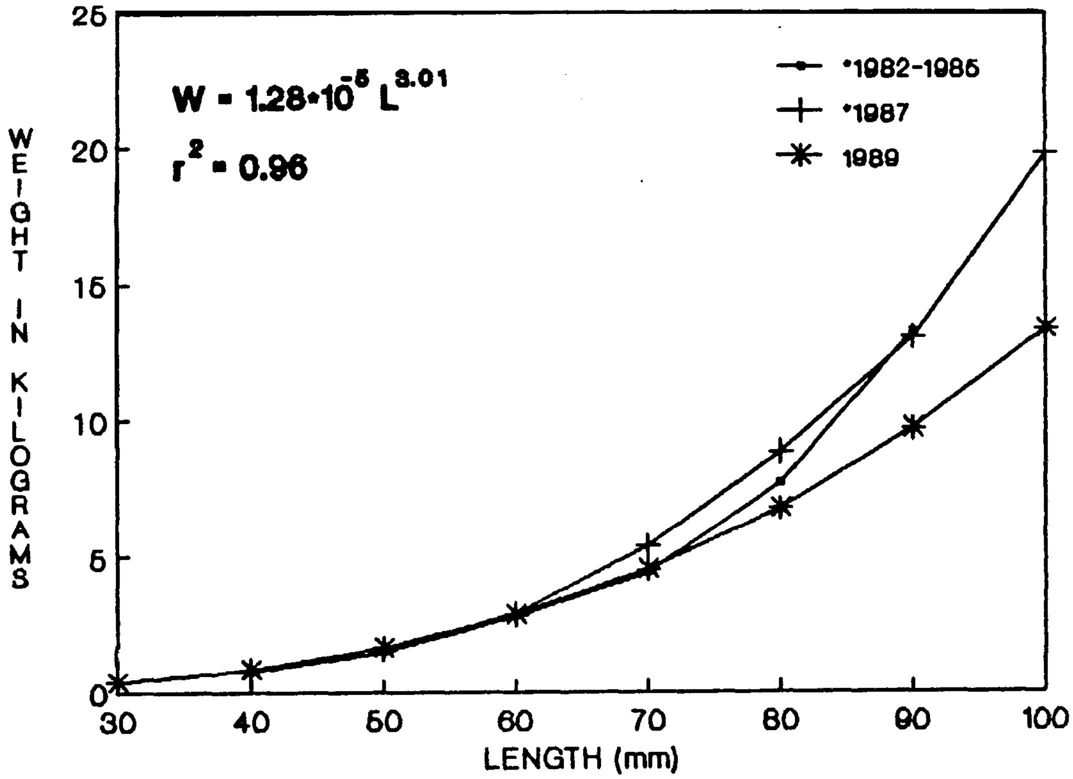

Figure 20. Length-weight relationship of fall chinook, Coeur d'Alene Lake, Idaho. Equations are for the 1989 data.

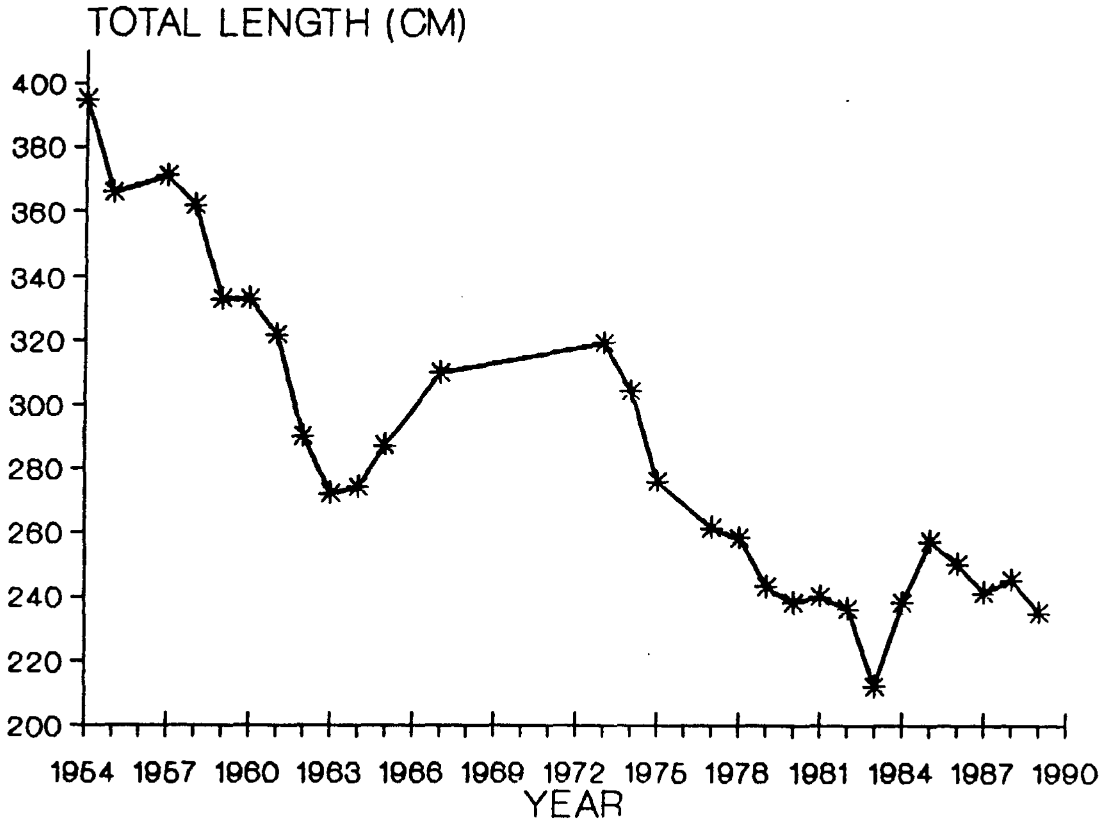

Figure 21. Mean total length of kokanee spawners in Coeur d'Alene Lake, Idaho, 1954-1989.

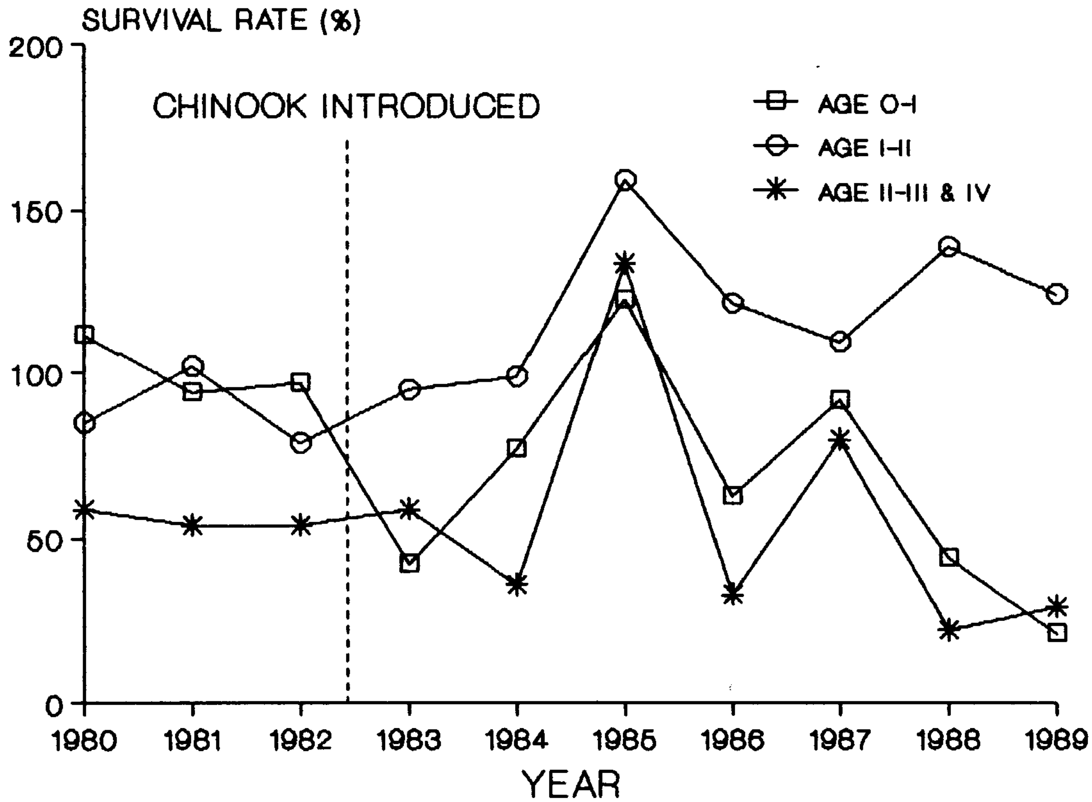

Figure 22. Survival rates of various age classes of kokanee in Coeur d'Alene Lake, Idaho.

severely-reduced year class could have been the first indication of chinook over-eating their prey base, although it could have been an artifact of bias in the trawl sampling. It is imperative that standardized trawling be conducted annually.

A further indication that chinook are having an effect on forage is their reduced weight for a given length (Figure 20). This indicated that chinook are expending more energy to find food and was not thought to be due to chinook stock differences; Bonneville or Lake Michigan stocks.

It is expected that chinook will over-shoot the kokanee prey base if too many chinook are stocked into Coeur d'Alene Lake or if chinook can successfully spawn in the wild. The sighting of 52 chinook redds in the Coeur d'Alene River drainage showed that wild spawning was occurring. This run of adults was only the first generation of wild fish, and so a logistic increase in the wild population appeared to be occurring. This expansion of wild stocks emphasizes the need for control measures. Once problems are detected with the kokanee fishery (too few age 3+ kokanee), there will already be three additional age classes of chinook in the lake. Thus, it may take at least three years for the kokanee population to recover once chinook abundance is reduced. A better alternative would be to control wild reproduction ahead of time and then slowly vary stocking rates of hatchery chinook until both fisheries are optimized.

Chinook Stocking-Three variables were adjusted to maximize chinook survival during stocking: 1) total length, 2) time of release, and 3) stock of chinook. Our goal for mean length of post-smolts to stock was 150 mm. This size would allow chinook to start on a kokanee diet immediately after stocking. This goal was rarely reached since 1982. July stocking has been done for the last four years to put chinook into the lake just after kokanee fry emerge.

Lake Michigan stock chinook should live a year longer before spawning and dying and, thus, be much larger. This was not apparent in the Wolf Lodge Creek spawning run during 1989. Eighty-nine percent of the hatchery chinook had adipose clips defining them as from the July 1, 1987 stocking of Lake Michigan stock. Thus, almost 90% of the Michigan stock were three-year-old (age 2+) spawners. Eleven percent of the Michigan stock spawners were from the July 2, 1986 stocking and were, thus, four-year-old (age 3+) spawners, and no fish were either two or five years old. Wild (or natural) chinook in the spawning run were, on average, larger (Figure 23). They were also, on average, older. Thirty-two percent were three years old (age 2+) and 68% were four years old (age 3+). Why the chinook stocks are not living to their expected ages is unknown. One possibility is that the accelerated growth while fingerlings are in the hatchery is causing them to mature earlier than wild chinook. Harvest of chinook may also be increasing.

Chinook Growth-One hypothesis we have been using is that hatchery chinook will start on a kokanee diet as age 0+ and be a years growth ahead of wild chinook, which may spend some of their first summer residing in rivers and streams or feeding on zooplankton in the lake. Also, stocking chinook in

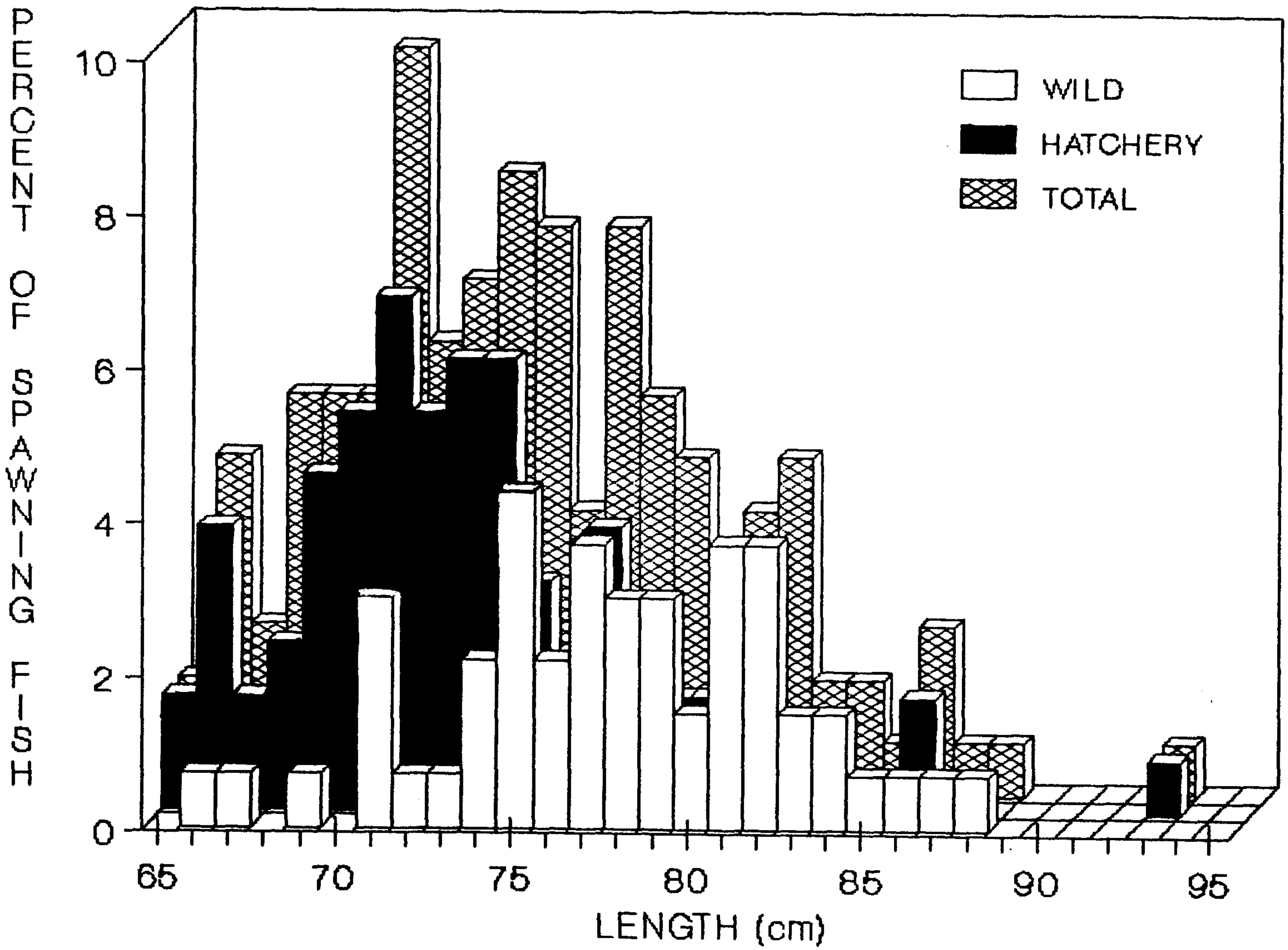

Figure 23. Chinook lengths in the spawning run in Wolf Lodge Creek during September and October, 1989.

Wolf Lodge Bay where most kokanee fry were produced was thought to greatly help their growth. Both these hypotheses appeared false during the 1989 spawning run. Age 2+ wild chinook averaged 74.4 cm in fork length (s = 4.5115, n = 39), and hatchery age 2+ chinook averaged 74.0 cm (s = 4.2126, n = 72). Age 3+ wild and hatchery fish averaged 78.7 cm (s = 3.9403, n = 27) and 81.0 cm (s = 5.9791, n = 9), respectively. Thu-s, no difference in growth rate was detected.

Implications of this finding were that size of chinook and possibly location of stocking are not critical to growth rate. Stocking at a large size may even be detrimental to ultimate size if it means some chinook will mature a year earlier. Chinook size and location of stocking may, however, be critical to survival rates and may influence their impact on kokanee.

LOWLAND LAKES PROGRAM

Creel Survey

Routine creel interview data was collected on area waters to describe fisheries and pinpoint areas where programs were or were not working. Most of the data was collected by conservation officers and some interviews were collected by other regional personnel. Sampling effort was spread throughout the region and not partitioned for equal effort on various lakes nor stratified by season or day. Interviews were generally not completed trip information.

Results and Discussion

Numerous area waters were sampled throughout the region during 1989 (Table 9). Some of the highest harvest rates were in area waters which contained kokanee, such as Lake Pend Oreille (1.24 fish/h) and Spirit Lake (1.04 fish/h). Other relatively high harvest rates were estimated for rainbow trout fisheries in Brush Lake (0.56 fish/h), Cocolalla Lake (0.50 fish/h), Freeman Lake (0.59 fish/h), and Solomon Lake (1.20 fish/h).

Lake Renovation

Jewel Lake and Sinclair Lake

Both Jewel and Sinclair lakes were rotenoned during the fall of 1989. A fishing pier was built this year on Sinclair Lake, and it will be managed as a put-and-take rainbow fishery. Jewel Lake will be restored as a salmonid fishery, and both westslope cutthroat and Henrys Lake rainbow/cutthroat trout hybrids will be tested for ability to provide a fishery. Low levels of kokanee will also be stocked in Jewel Lake to provide diversity.

Table 9. Angler interview data collected at north Idaho lakes, 1989.

Lake/dates	Anglers	Hours fished	LT	CT	RBT	KOK	FC	BK/ BLT	PER	BASS	CRP	Total Salmon	Total Spiny-
			Harvest rate (fish/hour)										
Brush L. (Apr-Jul)	16	23			0.565							0.565	0.13
Cd'Alene L. (Mar-Jul)	236	581		0.02		0.6	0.002					0.021	
Clark Fork R. (May-Aug)	520[1]	2082[1]		0.01		0.003		0.04*				0.066	
Cocolalla L. (Feb-	20	20			0.50				0.85			0.55	0.85
Fernan L. (Feb-Jul)	129	152.6			0.2					0.007		0.2	0.07
Freeman (Feb-Apr)	10	17			0.59				0.18			0.59	0.18
Hauser L. (Jan-May)	101	182.5		0.02	0.09			0.05	0.3	0.03	0.39	0.16	
Hayden L. (Feb-Jul)	359	976		0.007	0.02				0.16	0.09	0.08	0.03	0.23
Kelso L. (Jan-Jun)	51	92			0.25							0.25	0.01
Kootenai R. (Apr-Jul)	28	58		0.02	0.155							0.26	--
Moyie R. (Jun-Jul)	8	8			0.125							0.125	
Pend Oreille L. (May-Ag)	549	1701.5		.0006	.0082	1.228						1.24	
Pend Oreille L.[2]	146	727						0.07*				0.07	
Pend Oreille R. (Feb-Oct)	19	29			0.03				0.10	0.03		0.03	0.48
Perkins L. (Jul-Aug)	19	31								0.03			1.45
Priest L. (Feb-Aug)	193	445	0.12									0.12	
Robinson L. (Apr-Jul)	25	33			0.03							0.06	0.09
Round L. SP (Jan-Aug)	18	33			0.27				0.61			0.27	0.61
Sansoucci L. (Jan-Apr)	13	14			0.29							1.14[3]	
Smith L. (Apr)	17	16			0.375							0.375	
Solomon L. (Jul)	3	5			1.20							1.20	
Spirit L. (Jan-Jun)	311	1044			0.02	1.01						1.04	
[illegible]	[illegible]	[illegible]			[illegible]							[illegible]	

[1]Total estimated fishing pressure on Clark Fork River 5/28 to 8/19, 1989.
[2]Interviews of Bull trout fishermen only. [3]Most of trout harvest was brook trout.

RBT = Rainbow trout BASS = Large/smallmouth CT = Cutthroat trout BLT = Bull trout BK = Brook trout
KOK = Kokanee CRP = Crappie LT = Lake trout PER = Perch

R189T1

Blue Lake

Blue Lake (Bonner County) was proposed this year as a potential lake renovation (rotenone) site. Numerous small bullheads and perch were collected in gill nets during summer, which indicated the need for reclamation. Once proposed, the Department received approximately 60 signatures on petitions and a dozen letters opposing this project. Blue Lake was subsequently electrofished in the fall to determine if it really was full of 1-2 kg bass as anglers reported.

Samples collected from Blue Lake would indicate few fish are of harvestable size (Figure 24). A few nice size crappies and bullhead were collected, but it is doubtful these species attract much attention. Electrofishing during spawning time, however, may have been more effective in getting larger bass. But there was little indication angler reports were correct. The lake was stocked with scuds Gammarus g., bluegill sunfish and tiger muskies in an effort to bolster the fishery. The lake will not be rotenoned during the next 5-year planning period, but will be evaluated to see if the new species introductions are enhancing the fishery. The lake will be reconsidered for reclamation and warmwater fishery enhancement in the future if fish population assessment and the public supports such an effort.

RECOMMENDATIONS

1. Discontinue stocking kokanee in Priest Lake.
2. Do not further restrict harvest of Lake Pend Oreille bull trout at this time since the population appears numerically stable.
3. Do not stock kokanee fry in Spirit Lake in 1989.
4. Continue annual midwater trawling on Coeur d'Alene and Spirit lakes to assess kokanee population dynamics.
5. Tag an additional sample of largemouth bass in Hayden Lake with reward tags to further evaluate exploitation.
6. Evaluate return-to-the-creel of cutthroat trout stocked into Priest and Pend Oreille lakes.
7. Collect data so that density of kokanee in Spirit Lake can be correlated with catch rates.
8. Work with Washington Water Power Company to establish minimum stream flow requirements for the Clark Fork River to protect and enhance fish habitat.
9. Intensively monitor kokanee in Coeur d'Alene Lake during 1990.
10. Monitor and regulate wild chinook spawning in tributaries to Coeur d'Alene Lake so that production of wild chinook can be determined and controlled.

R189RPT

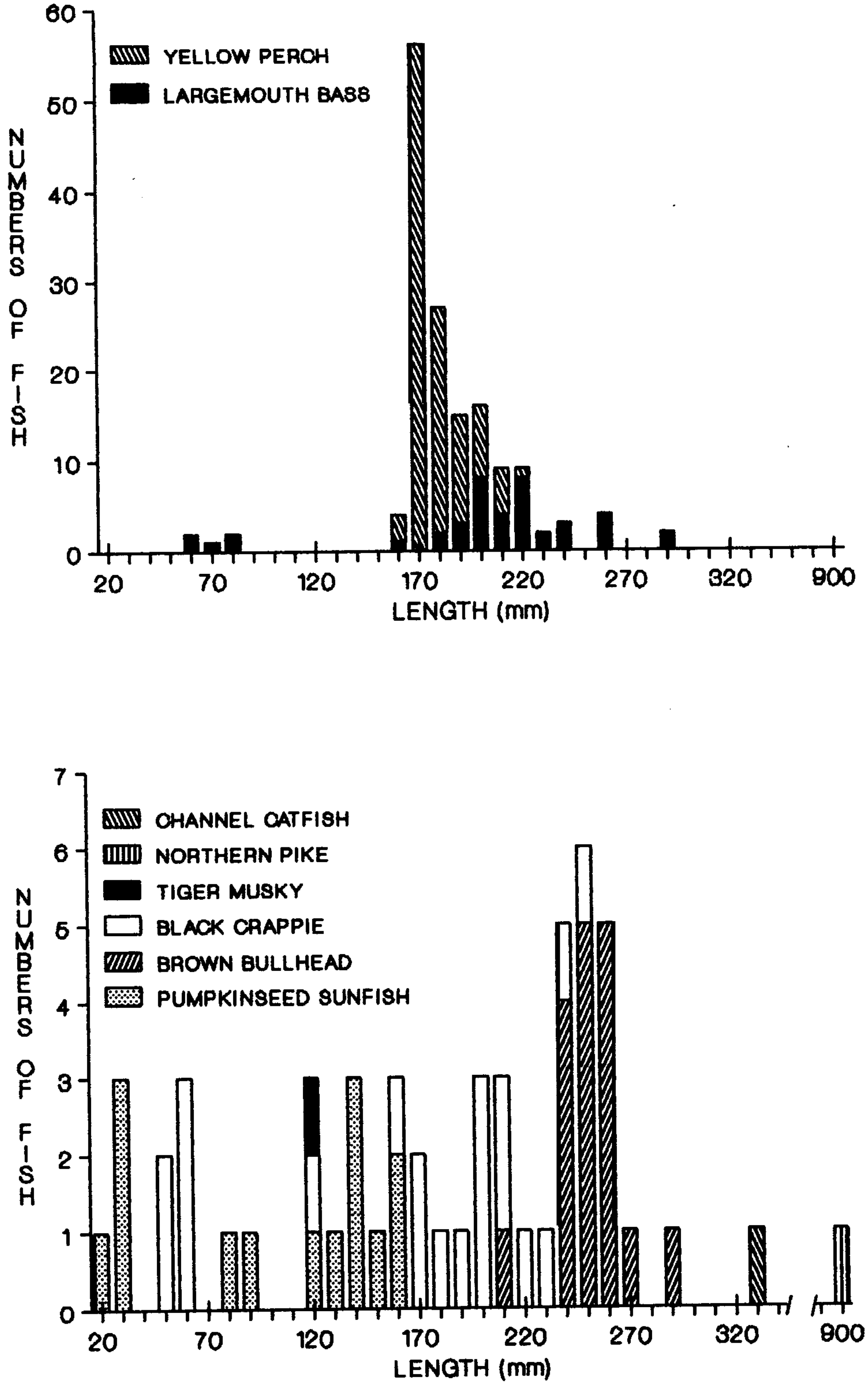

Figure 24. Sizes of various species of fish collected in Blue Lake, Idaho, 1989 to evaluate the lake for renovation.

LITERATURE CITED

Bjornn, T.C. 1957. A survey of the fishery resources of Priest and Upper Priest lakes and their tributaries. Idaho Department of Fish and Game, Job Completion Report, Project F-24-R, Boise.

Bowler, B., B.E. Rieman, and V.L. Ellis. 1979. Pend Oreille Lake Fisheries Investigations. Idaho Department of Fish and Game, Job Performance Report, Project F-73-R-1, Boise.

Bowles, E.C., V.L. Ellis, D. Hatch, and D. Irving. 1987. Kokanee stock status and contribution of Cabinet Gorge Hatchery, Lake Pend Oreille, Idaho. Idaho Department of Fish and Game, Annual Report to Bonneville Power Administration, Contract DE-AI79-85BP22493, Project 85-339, Boise.

Fraley, J., D. Read, and P. Graham. 1981. Flathead River fishery study - 1981. Montana Department of Fish, Wildlife and Parks, Helena.

Graham, P.J., D. Read, S. Leathe, J. Miller, and K. Pratt. 1980. Flathead River Basin fishery study - 1980. Montana Department of Fish, Wildlife and Parks, Helena.

Hoelscher, B. and T.C. Bjornn. 1988. Idaho Department of Fish and Game, Job Completion Report, Project F-71-R-10, Job 8, Boise.

LaBolle, L.D. 1988. Region 1 Lowland Lakes Investigations. Idaho Department of Fish and Game, Job Performance Report, Project F-71-R-12, Boise.

Lewis, S.L. and R.B. Lindsay. 1976. Population dynamics of kokanee salmon in Odell Lake. Oregon Department of Fish and Wildlife, Annual Progress Report, Project F-71-R-12, Job 10 and 11, Portland.

Mauser, G.R. 1986a. Enhancement of trout in large North Idaho lakes. Idaho Department of Fish and Game, Job Performance Report, Project F-73-R-7, Boise.

Mauser, G.R. 1986b. Enhancement of trout in large North Idaho lakes. Idaho Department of Fish and Game, Job Performance Report, Project F-73-R-8, Boise.

Pratt, K.L. 1984. Pend Oreille trout and char life history study. Idaho Department of Fish and Game, Boise.

Pratt, K.L. 1985. Pend Oreille trout and char life history study. Idaho Department of Fish and Game, Boise.

Rieman, B.E. and K.A. Apperson. 1989. Westslope cutthroat trout synopsis and analysis of fishery information. Idaho Department of Fish and Game, Job Performance Report, Project F-73-R-11, Job 1, Boise.

Shepard, B.B., J.J. Fraley, T.M. Weaver and P.J. Graham. 1982. Flathead River fisheries study - 1982. Montana Department of Fish, Wildlife and Parks, Helena.

R189RPT

JOB PERFORMANCE REPORT

State of: Idaho

Name: REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

Project No.: F-71-R-12

Title: Region 1 Rivers and Streams Investigations

Job No.: 1-c

Period Covered: July 1, 1989 to June 30, 1990

ABSTRACT

Deer Creek, Moyie River drainage, was found to contain good densities of rainbow trout in the lower stream sections and relatively high densities of cutthroat trout in the upper sections. Stocking rainbow trout in 1984 resulted in no significant change in rainbow trout density.

Trappers Creek, Upper Priest Lake drainage, contained extremely high densities of cutthroat trout. The presence of larger trout would indicate this was a resident trout population.

Ruby Creek also contained good densities of cutthroat trout. This stream may be contributing significantly to the cutthroat population in Upper Priest Lake.

A 12-week creel survey on the Clark Fork River during mid-summer indicated fishing effort was only 2,159 hours. Catch, catch rates, harvest, and harvest rates were also quite low. Most of the harvest was bull trout and brown trout, with a few kokanee and cutthroat trout harvested. Small rainbow trout were caught (estimated total of 146) and released, which may have been Gerrard strain fish rearing in the river.

Two transects were snorkeled in the Coeur d'Alene River drainage. The average number of cutthroat counted in each sampling station decreased from 27.3 in 1988 to 22.8 in 1989. The average number of cutthroat per transect in Teepee Creek increased in 1989 after two years of declines.

R189RPT

A weir and trap were installed in the St. Joe River to test the feasibility of collecting downstream migratory squawfish. Failure of the weir on three occasions due to debris buildup prevented collection of squawfish.

Authors

Melo A. Maiolie
Regional Fishery Biologist

James A. Davis
Regional Fishery Biologist

R189RPT

OBJECTIVES

1. To determine if supplemental stocking of rainbow trout in Deer Creek improved trout densities.

2. To measure trout densities in Ruby and Trapper creeks to aid in formulating comments on land use activities.

3. To characterize the fishery in the Clark Fork River by conducting a creel survey.

4. To monitor the response of westslope cutthroat trout to special regulations.

5. Evaluate the use of a weir to control northern squawfish in the St. Joe River.

METHODS AND RESULTS

Trout Densities Inventories

Surveys were conducted on selected Region 1 streams to gather baseline data on trout density. This information will aid regional personnel in evaluating regulations and in formulating comments on land use activities. The four stream surveys during 1989 were Deer Creek, Trappers Creek, Hughes Fork, and Ruby Creek.

Deer Creek

Deer Creek is a tributary to the Moyie River in Boundary County. Four 100-m reaches of Deer Creek were snorkeled on July 14, 1989 (Figure 1). The transects had the following locations: 1) 1.75 km from the mouth, just south of Road 2541A, 2) 5.3 km from the mouth, just below the Placer Road connection, 3) 12.0 km from the mouth, just above the Faro Creek confluence, and 4) just below the confluence of Deer Creek and its West Branch. The upper three transects were those surveyed during July 1985 (Robertson and Horner 1986).

Survey results for each transect were divided by species into each of four size classes (Table 1). Rainbow trout predominated in lower stream sections, but species composition shifted to cutthroat trout in the upper reaches.

Deer Creek, one of the only spawning tributaries for the Moyie River, was stocked in 1984 with 15,640 age 1+ Kootenai River rainbow trout in the hopes of bolstering the wild rainbow trout population in the Moyie River (Rieman and Horner 1985). The stocking resulted in no significant change in

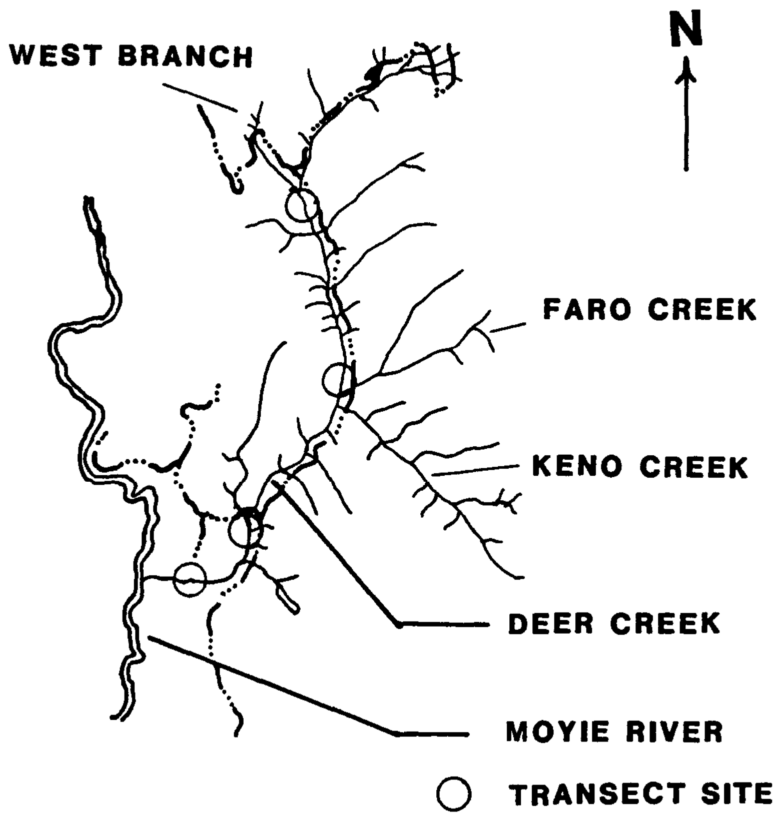

Figure 1. Location of four transects used to estimate trout densities in Deer Creek, Moyie River drainage, Idaho, 1989.

Table 1. Observed trout densities (fish/100 m^2) in four snorkeling transects in Deer Creek, Moyie River drainage, Idaho, July 14, 1989.

Transect location	Transect area (m^2)	Species[1]	Observed densities (fish/100 m^2) Fry	50-150 mm	150-250 mm	250+ mm
1.75 km from mouth (Road 2541A)	904	CT	0.0	0.8	0.0	0.0
		RB	0.0	2.6	1.4	0.3
		BK	0.0	0.0	0.0	0.0
		WF	0.0	0.1	0.6	0.0
5.3 km from mouth (Placer Road connection)	667	CT	0.0	6.3	3.6	0.8
		RB	0.0	0.1	0.8	0.0
		BK	0.0	0.3	0.3	0.0
12.0 km from mouth (Above Faro Creek confluence)	657	CT	0.0	2.0	1.8	0.0
		RB	0.0	0.0	0.0	0.0
		BK	0.0	0.0	0.2	0.0
West Branch (Just below confluence with Deer Creek)		CT	0.0	4.5	3.3	0.2
		RB	0.0	0.0	0.0	0.0
		BK	0.0	0.0	0.0	0.0

[1]CT = cutthroat trout
RB = rainbow trout
BK = brook trout
WF = mountain whitefish

R189T2

rainbow trout density between 1985 and 1989. With the exception of the lower transect, Deer Creek was predominantly a cutthroat trout stream. Likely, this was due to cutthroat being better adapted to this habitat type, and was not due to a simple lack of recruitment of rainbow trout. Any future stocking should be viewed with caution.

Trapper Creek

Trapper Creek is a tributary to Upper Priest Lake in Bonner County. It was surveyed to determine cutthroat and brook trout densities, since this area is the site of increased logging activity.

The lower transect was 100 m long, and the lower end of the transect was approximately 120 m above a bridge on an unnumbered spur road off Road 655 (Figure 2). This transect was approximately 3.2 km above the mouth. The upper transect was approximately 300 m above the road bridge on Forest Service Road 655 and 8.0 km above the mouth of the creek. This transect went upstream for 67 m before a bedrock barrier was encountered that blocked all fish passage.

Cutthroat densities in both transects were quite high (Table 2). It was uncertain as to whether these trout were resident, adfluvial, or both. At least a portion of the population was thought to be resident because of the presence of fish over 300 mm. Cobble embeddedness was quite low at approximately 5% in the lower transect and 15% in the upper transect.

Ruby Creek

Ruby Creek was also surveyed to acquire baseline fish density information. Three 100-m transects were snorkeled; 0.8 km, 1.0 km, and 1.2 km below the Forest Service Road 655 bridge (Figure 2). (These transects were approximately 2.0 km, 1.8 km, and 1.6 km above the streams mouth.) Brook trout and cutthroat trout were enumerated separately and divided into three size categories.

Good densities (>5/100 m^2) of cutthroat trout were seen (Table 3). No bull trout were noted in any transect. Visual estimates of cobble embeddedness ranged from 10% to 80X, which indicated rather high siltation in the drainage. The source of siltation was unknown. Brook trout were also present in the stream and larger ones appeared to be exerting territorial dominance by displacing cutthroat trout in some pools.

Clark Fork River Creel Survey

Introduction

Washington Water Power Company proposed changing the discharge from Cabinet Gorge Dam and, thus, altering the flow of the Clark Fork River. The

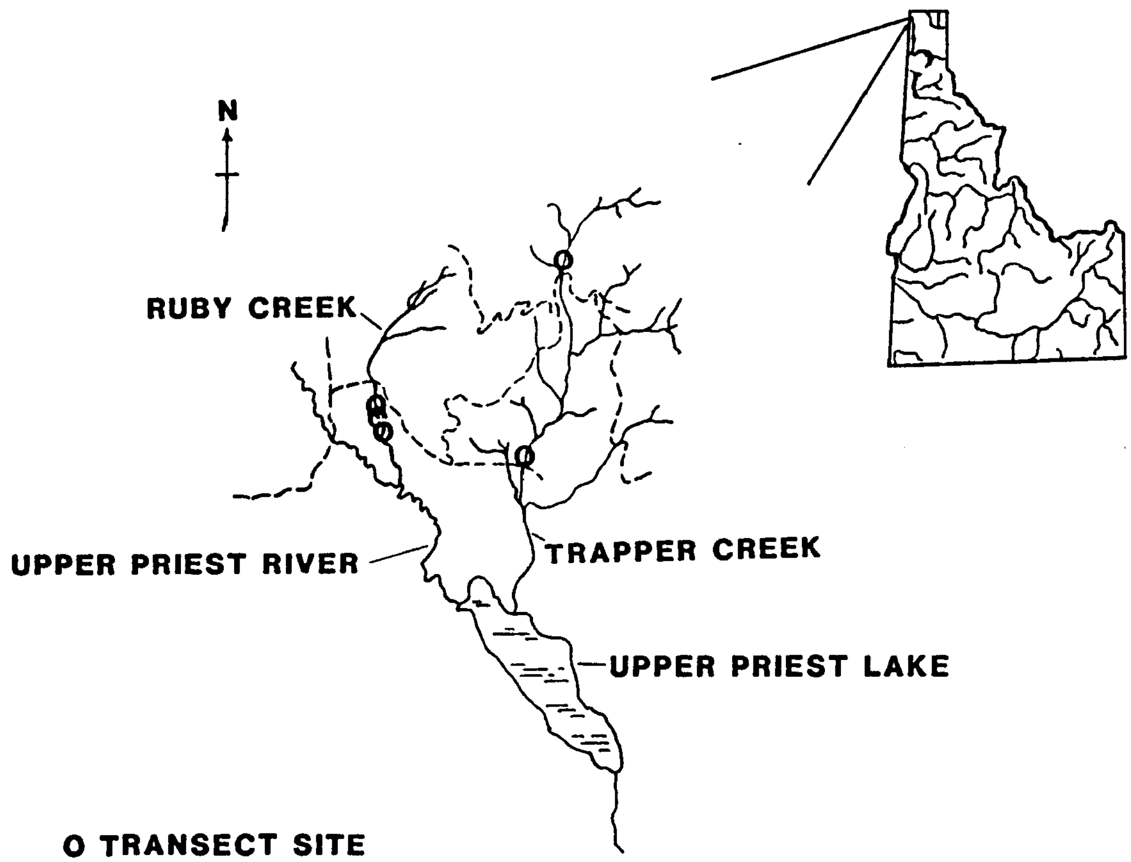

Figure 2. Location of transects used to estimate trout densities in Trapper Creek and Ruby Creek, Upper Priest River drainage, Idaho, 1989.

Table 2. Observed trout densities (fish/100 m^2) in two snorkeling transects in Trappers Creek, Upper Priest Lake drainage, Idaho, August 11, 1989.

Transect location	Transect area	Species[1]	Trout density (fish/100 m2) by size		
			0-50 mm	50-100 mm	>100 m
Upper Transect (above bridge on Rd. 655, 8.0 km above mouth)	337 m^2	CT	1.19	10.98	8.90
Lower Transect (3.2 km above mouth)	572 m^2	CT	1.1	5.8	4.7

[1]CT = cutthroat trout

R189T2

Table 3. Observed trout densities (fish/100 m^2) in Ruby Creek, Upper Priest Lake drainage, Idaho, August 10, 1989.

Transect location	Transect area	Species'	Trout density (fish/100 m^2) by size		
			0-50 mm	50-100 mm	>100 mm
0.8 km below Rd 655 bridge	301 m^2	CT	1.00	5.98	1.00
		Bk	0	1.00	1.00
	Unk	0.66	0.66		
1.0 km below Rd 655 bridge	259 m^2	CT	0.34	4.25	0.34
		Bk	0	2.32	1.16
	Unk	2.70	1.16	0	
1.2 km below Rd 655 bridge	377 m^2	CT	0.27	5.04	0.53
		Bk	0.53	1.86	0.80
	Unk	2.39	1.59	0	

[1]CT - Cutthroat trout Bk = Brook trout
Unk = Unknown species

R189T2

existing regime was to release at least 87 m^3/s at night to preserve aquatic life. The proposed regime was to cut nighttime discharge from the turbines during June and July to 0 m^3/s, allowing leakage from the dam and spring water recharge to maintain a river flow of 17 m^3/s, theoretically. We conducted a creel survey on the river this summer to determine what type of fishery this may directly impact.

Methods

A stratified random creel survey (Malvestuto, 1983) was conducted on the Clark Fork River from May 28 to August 19. This time period was divided into two-week intervals and stratified by weekend and weekday day-types. Days were divided into thirds, and a time for a random count was selected during each third. Hours of fishing effort for a two-week interval were estimated by multiplying the mean angler count per day-type by the number of hours of daylight per day and then multiplying times the number of days of this type during the interval.

Results

Fishing effort on the Clark Fork River totaled 2,159 hours during the 12-week survey. Most effort by boat anglers occurred during the first census period, but bank angling peaked during the beginning of July (Table 4).

Bull trout, brown trout, cutthroat trout, rainbow trout, and kokanee were caught during the census (Table 5). Mean catch rate for these species ranged from 0.01 fish/h for kokanee to 0.07 fish/h for rainbow trout. A total of 82 bull trout, 54 brown trout, 23 cutthroat trout, and 11 kokanee were estimated to have been harvested (Table 6). Mean harvest rates for each species ranged from 0.0 rainbow trout/h to 0.04 bull trout/h (Table 6).

Discussion

Often times, large riverine systems below dams support quite productive fisheries. Water coming out of dams is usually cooler, high in nutrients and plankton, and generally silt free, which benefits downstream insect and fish populations. Possibly daily flow fluctuations, which went from over 425 m^3/s to 85 m^3/s, had depressed fish stocks. It is recommended that a minimum flow be established for the Clark Fork River that would protect and enhance fish habitat.

During the creel survey, anglers reported releasing an estimated 146 (150 mm) rainbow trout. These trout were most likely Gerrard rainbows that were rearing in the river. Thus, the river may be important as a rearing area for juvenile rainbow and may also be providing some recruitment to the lake.

Table 4. Fishing effort on the Clark Fork River, Idaho, May 28 to August 19, 1989.

Interval	Dates	Estimate hours fished		Total
		Boat	Bank	
1	5/28 - 6/10	490	261	751
2	6/11 - 6/24	154	96	250
3	6/25 - 7/08	88	386	474
4	7/09 - 7/22	108	341	449
5	7/23 - 8/05	40	65	105
6	8/06 - 8/19	40	90	130
TOTAL		920	1,239	2,159

R189T2

Table 5. Catch (number of fish) and catch rates (fish/h) of sport fish in the Clark Fork River, Idaho, May 28 to August 19, 1989.

Dates	Bull trout catch (rate)	Brown trout catch (rate)	Cutthroat trout catch (rate)	Rainbow trout catch (rate)	Kokanee catch (rate)
05/28-06/10	46(0.06)	46(0.06)	23(0.03)	69(0.09)	11(0.01)
06/11-06/24	14(0.06)	0(0)	0(0)	7(0.03)	0(0)
06/25-07/08	37(0.08)	19(0.04)	19(0.04)	19(0.04)	0(0)
07/09-07/22	0(0)	8(0.02)	17(0.04)	34(0.08)	0(0)
07/23-08/05	5(0.05)	0(0)	0(0)	5(0.05)	0(0)
08/06-08/19	12(0.09	0(0)	24(0.18)	12(0.09)	0(0)
TOTAL (Mean)	114(0.05)	73(0.03)	83(0.04)	146(0.07)	11(0.01)

R189T2

Table 6. Estimated harvest and harvest rates (fish/h) of sport fish in the Clark Fork River, Idaho, May 28 to August 19, 1989.

Dates	Bull trout harvest (rate)	Brown trout harvest (rate)	Cutthroat trout harvest (rate)	Rainbow trout harvest (rate)	Kokanee harvest (rate)
05/28-06/10	46(0.06)	46(0.06)	23(0.03)	0(0)	11(0.01)
06/11-06/24	12(0.05)	0(0)	0(0)	0(0)	0(0)
06/25-07/08	19(0.04)	0(0)	0(0)	0(0)	0(0)
07/09-07/22	0(0)	8(0.2)	0(0)	0(0)	0(0)
07/23-08/05	5(0.5)	0(0)	0(0)	0(0)	0(0)
08/06-08/19	0(0.0)	0(0)	0(0)	0(0)	0(0)
TOTAL (Mean)	82(0.04)	54(0.02)	23(0.03)	0(0)	11(0.01)

R189T2

Cutthroat Trout Density Estimates-Coeur d'Alene River

We continued to evaluate response of westslope cutthroat trout to catch-and-release regulations in the upper Coeur d'Alene drainage (Figure 3). Two standardized transects were snorkeled in 1989 as described in Horner et al. (1988)(Table 7, Figure 3).

The number of cutthroat trout less than 300 mm TL have increased since 1980, while cutthroat trout greater than 300 mm TL has generally remained unchanged in the Coeur d'Alene River between Yellowdog Creek and Teepee Creek (Figure 4). The number of cutthroat trout in both length groups have steadily declined in Teepee Creek, a tributary to the Coeur d'Alene River (Figure 5). The failure of cutthroat trout to respond to catch-and-release regulations in Teepee Creek could be due to continued habitat degradation and possibly a large amount of noncompliance with special regulations.

New regulations have been put into effect in the tributaries below Yellowdog Creek on the Coeur d'Alene River. The regulation was three cutthroat, none under 8 inches. In 1990, **six** fish of any size may be taken, but fishing does not open until July 1. We will continue to monitor the effects of these new regulations on the cutthroat trout population in the mainstem Coeur d'Alene River and tributaries.

Northern Squawfish Control Effort

Introduction

In recent years, considerable public dissatisfaction has been expressed about the large number of northern squawfish in the St. Joe and St. Maries rivers. Northern squawfish are a native cyprinid in northern Idaho, which has co-evolved with native salmonids such as westslope cutthroat trout and bull trout. Squawfish are opportunistic feeders, their diets consisting of aquatic insects, oligochaetes, crayfish, and fish (Falter 1969; Reid 1971; Beamsderfer 1983). MacPhee and Reid (1971) believed that any reduction in the number of squawfish should increase the abundance of food items available to preferred species.

In addition to competing for food, squawfish may also compete with game fish species for spawning and rearing space (Jeppson and Platts 1959). More recent research, however, indicated competition between squawfish and salmonids was minimal (Brown and Moyle 1981).

Reid (1971) determined squawfish in the St. Joe River typically began their upstream spawning migration in April, staging in the slackwater from St. Joe City downstream. They began moving into the fast water reaches above St. Joe City (up to Bluff Creek) in June, reaching peak numbers in late June and early July. During the peak of the spawning run, squawfish were congregated in large schools in the deeper pools (>3.5 m deep) in the

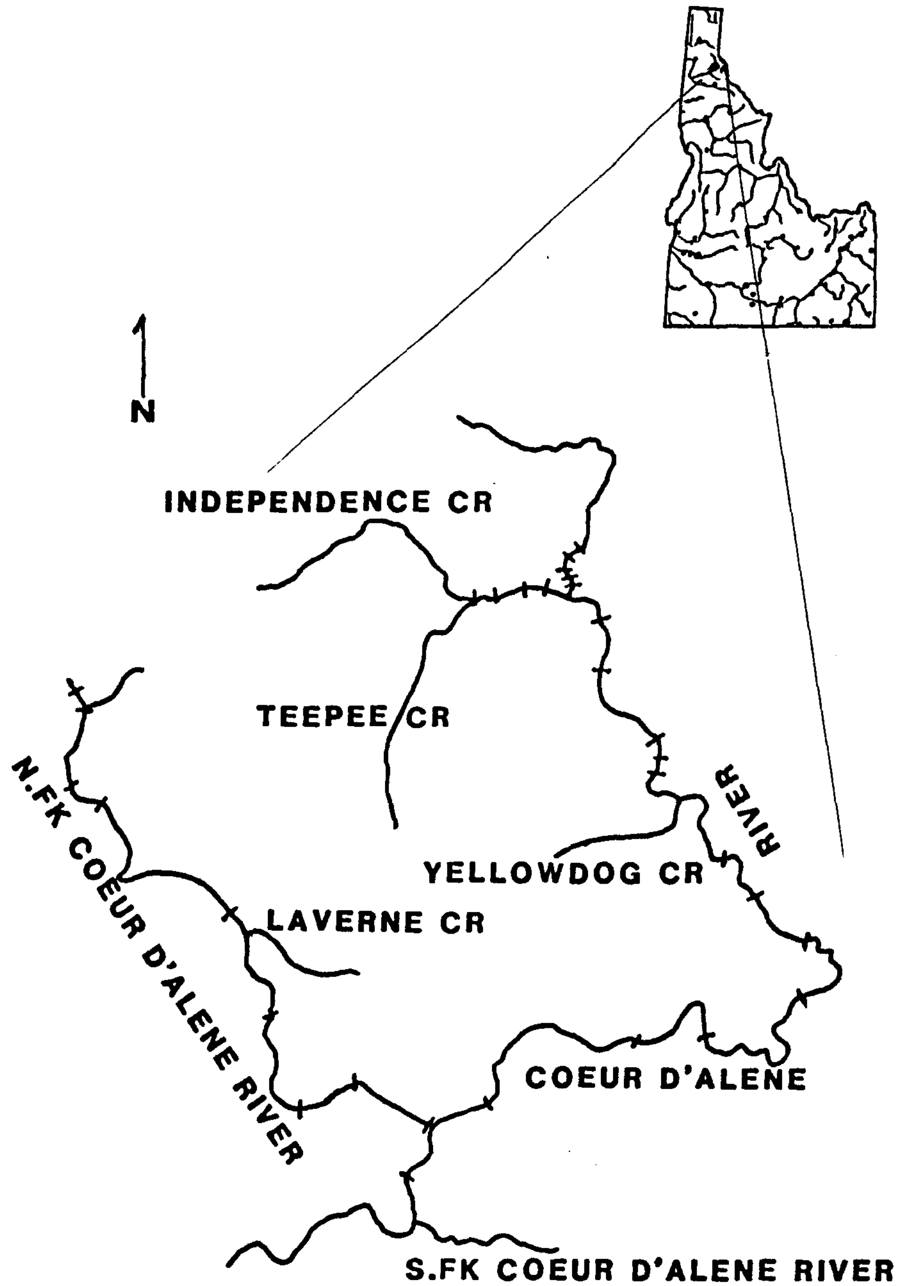

Figure 3. Locations of snorkel transect sections in the Coeur d'Alene River drainage, Idaho.

Table 7. Average number of cutthroat trout (<300 mm and >300 mm) per transect in 1980 to 1981, 1987, 1988, and 1989 from locations in the Coeur d'Alene River drainage, Idaho.

Site	Month/Year	<300 mm	>300 mm	Total
Coeur d'Alene River between Yellowdog and Teepee creeks (catch-and-release)	Jul/80-81	8.4	2.4	10.8
	Aug/80-81	4.5	1.8	6.3
	Sep/80-81	3.9	1.5	5.4
	Aug/87	22.6	2.8	25.4
	Sep/87	17.4	2.8	20.2
	Jul/88	20.3	2.0	27.3
	Aug/89	21.6	1.2	22.8
Teepee Creek between Independence Creek and the mouth (catch-and-release)	Jul/80-81	2.8	1.2	4.0
	Aug/80-81	0.5	2.0	2.5
	Sep/80-81	1.1	0.9	2.0
	Aug/87	0.4	1.8	2.2
	Sep/87	0	1.4	1.4
	Jul/88	0.7	0.5	1.2
	Aug/89	0.8	1.3	2.0

R189T2

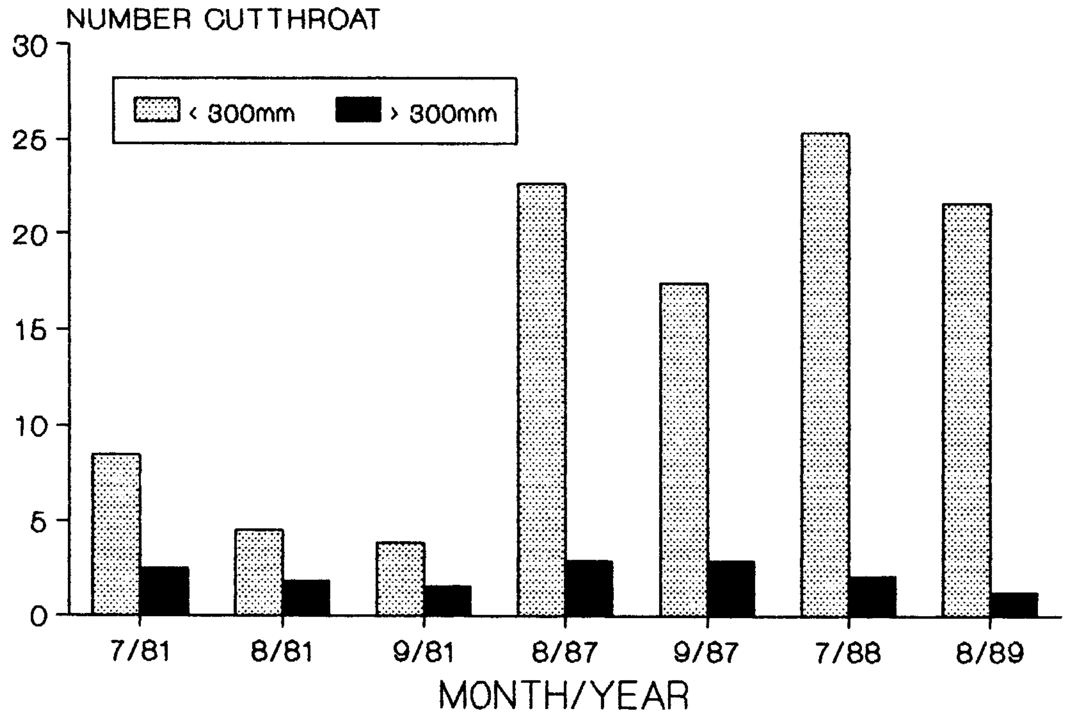

Figure 4. Westslope cutthroat trout densities in the Coeur d'Alene River, Idaho, between Yellowdog and Teepee creeks, 1981, 1987-1989.

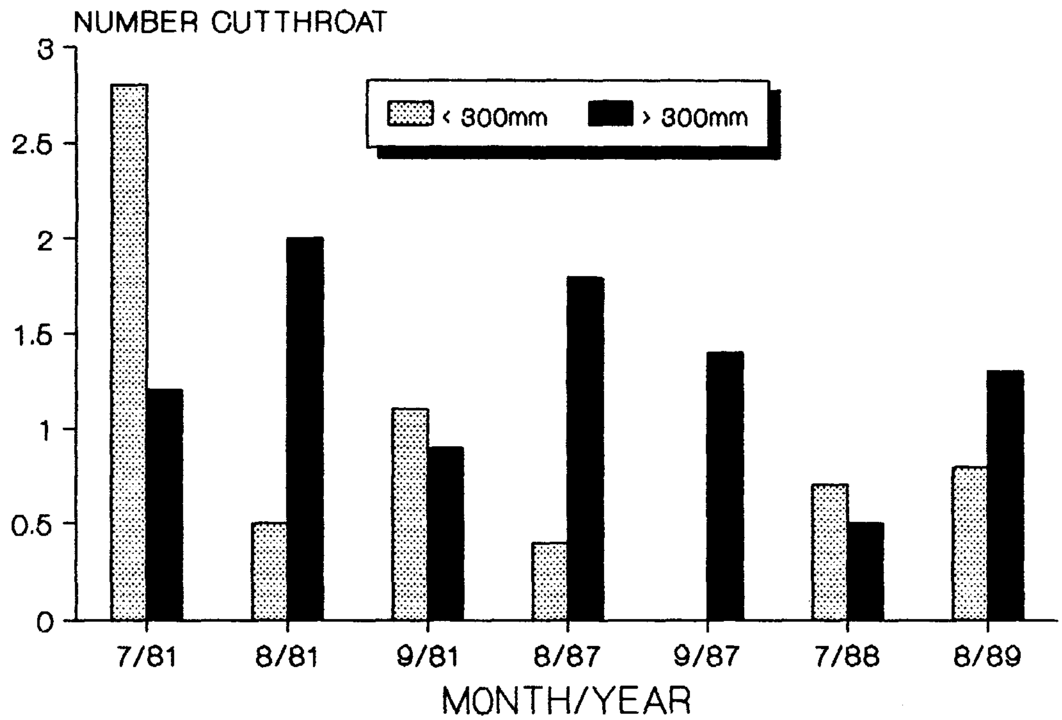

Figure 5. Westslope cutthroat trout densities in Teepee Creek, Idaho, Coeur d'Alene River drainage, between Independence Creek and the mouth (catch-and-release area) 1981, 1987-1989.

river over relatively large substrate (5-10 cm diameter). Water temperature appeared to be the primary stimulus for spawning activity. Optimum temperature for squawfish spawning was 15°C. Mature fish were not typically found with juveniles (age 0, 1, 2, and 3); the latter most often located in slough or backwater areas in quiet, shallow water over sand or silt substrate.

In the St. Joe River, squawfish seemed to prefer the fast water area below Avery. The preference was attributed to warmer water temperatures, reduced stream gradient, large pools, and the presence of adjacent slough and backwater areas for juvenile rearing (Reid 1971). Emigration of squawfish out of the fast water area began in July and continued through September and October, with the majority of fish migrating downstream. Howse (1966) reported large numbers of squawfish in Round Lake in August, and all fish sampled were spent.

Several methods of controlling squawfish were used with varying degrees of success. Gill netting (Forester and Ricker 1941; Jeppson 1957; Jeppson and Platts 1959), trapping (Hamilton et al. 1970), dynamiting (Jeppson 1957; Keating 1958), electrical barriers or electrofishing (Maxfield et al. 1970), and water level manipulation (Jeppson 1957; Pollard 1972) were tried on numerous bodies of water throughout the northwest. Chemicals were used extensively in the United States since the 1930s to manipulate undesirable fish communities (Gray et al. 1984). Rotenone was found to be expensive and nonspecific for squawfish (Rulifson 1984). Squoxin was successfully shown to be specific for squawfish (MacPhee 1967, 1969) and effective at reducing population levels (Keating et al. 1972; Ortmann 1973; Watson 1973).

In terms of effectiveness and desirability, squoxin would be the clear choice for control of squawfish in the St. Joe and St. Maries river systems. However, because squoxin is not a registered piscicide, it has not been available for use since the late 1970s, when it was used under an experimental permit. The US Environmental Protection Agency administers the registration of pesticides, and the process is not an easy matter. Data requirements are difficult to meet, must be developed according to specific guidelines, and take substantial amounts of time and money (two to four years and as much as 2.0 million dollars; Rulifson 1984). In addition, there are no longer any sources of squoxin available.

In 1988, a feasibility study was conducted on the St. Joe and St. Maries rivers to determine the effectiveness of various methods of removal on squawfish (Horner et al. 1989). Electrofishing was the most successful method tried. This method has several drawbacks, however. It is labor intensive, has a localized effect, and is ineffective in large deep pools where squawfish tend to congregate.

The use of a trap and weir can be successful in collecting migrating fish. In 19 a feasibility study was conducted to determine the possibility of success using a weir and trap in the St. Joe River.

Methods

The weir site was located approximately 0.5 km upstream from slack water near the St. Joe City bridge in St. Joe City, Idaho (Figure 6). Flow and depth measurements were taken with a Marsh McBerney 201 velocity meter, and a comparison was made to measurements at the nearest USGS gaging station, 17 km upstream at Calder, Idaho.

A V-shaped weir, approximately 69 miles long with a trap at the apex, was installed September 16, 1989. Single metal fence posts, 2 m long, were driven into the substrate, and weir panels were secured to the posts. The metal panels were 2- to 3-m long horizontal and 2 at 0.6-m long vertical 5.1 cm x 5.1 cm x 3.2 cm angle iron welded together. The horizontal angle iron had 2.5 cm holes drilled 1.9 cm apart along the entire length. Metal pickets, electrical conduit 1.5 m x 2.2 cm were inserted through the two horizontal bars and hammered into the substrate to simulate a picket fence. A hole was left at the apex were the trap was located so fish encountering the weir would eventually end up in the trap. The trap consisted of metal screens held in place by wooden panels on the top and bottom.

Results and Discussion

Unfortunately, the weir was installed after the majority of adult squawfish had migrated downstream to winter habitat. The weir was in place for 15 days, during which it was rebuilt two times because of washouts. The trap was removed after the third washout. The washouts occurred as a result of debris building up. Volunteers did not follow through on their commitment to clean the weir daily, which resulted in a build-up of leaf litter that caused **a** failure of the weir. Use of a tripod instead of a single fence post would have provided more support for the weir panels and may have delayed the washouts, but debris removal is imperative.

Water discharge at the time the weir was installed ranged from 10.6 to 17.1 m^3/s in Calder, Idaho, so flows at the weir site were relatively high due to incoming water from the various drainages between Calder and the weir site, 17 km downstream. Flow measurements were taken on July 5, 1989, 200 m upstream from the original weir site. It was not possible to take flow measurements across the entire river because the flow was too high. The flow at the gaging station was 42 m^3/s. It is not possible to safely install **a** temporary weir in flows that exceed 42 m^3/s in the St. Joe River. Biologically, the best time to efficiently collect squawfish is during the spawning migration (April through June). However, average river discharge during the spawning migration in June during the past nine years, 1979-1988, ranged from 39.6 to 197.6 m^3/s at Calder. In most years, it would not be possible to put a weir in the St. Joe River in June to collect the spawning migration of squawfish.

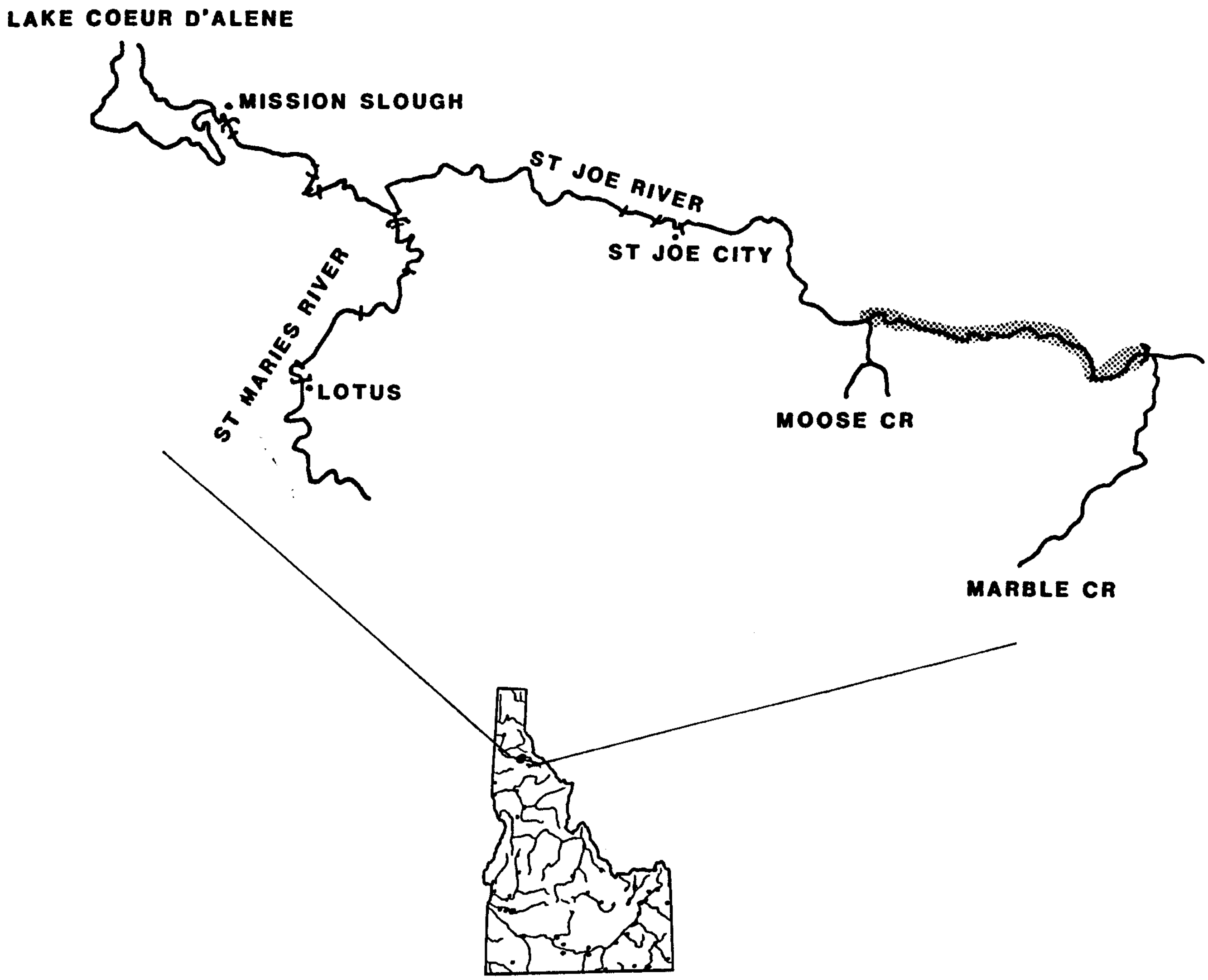

Figure 6. Location of weir near St. Joe City, St. Joe River drainage, Idaho.

There is a downstream migration in July and August after spawning. But the combination of flows higher than 42.3 m^3/s in July and the extended migration until August preclude installing a weir to collect downstream migrants.

Most of the studies and work have been in the -St. Joe River. The St. Maries River, a tributary to the St. Joe River, also has a large population of squawfish and is a smaller river than the St. Joe River. The 9-year June average discharge for the St. Maries ranges from 3.8 to 18.5 m^3/s. Flows in excess of 14.2 m^3/s may preclude safely installing a temporary weir. In most years, it would be possible to install a weir to trap upstream migrating squawfish. Researchers have documented squawfish as far upstream as the Middle Fork St. Maries River (Ortmann 1973; Goodnight and Mauser 1974; and Apperson et al. 1988) (Figure 4). A weir site just above St. Maries, Idaho, at Lotus would trap a major portion of the spawning population. In 1990, an attempt will be made to trap squawfish in June in the St. Maries River.

RECOMMENDATIONS

1. Rainbow trout stocking in Deer Creek should not be continued as a method to improve trout densities.

2. The Department should try to influence land use activities to whatever extent possible to maintain quality trout habitat in Trapper and Ruby creeks.

3. We recommend the establishment of minimum stream flows on the Clark Fork River to protect and enhance fish habitat.

4. Continue to monitor changes in the westslope cutthroat trout densities. Determine densities in all transects in 1991.

5. Attempt to construct a temporary weir in St. Maries River prior to northern squawfish spawning run.

LITERATURE CITED

Apperson, K.A., M. Mahan, and W.D. Horton. 1988. North Idaho streams fishery research. Idaho Department of Fish and Game. Study Completion Report. Project F-73-R-10, Job 1, Boise.

Beamsderfer, R.C. 1983. Reproductive biology, early life history and microhabitat of northern squawfish, Ptychocheilus oregonensis, in the St. Joe River, Idaho. Master's thesis, University of Idaho, Moscow.

Brown, L.R. and P.B. Moyle. 1981. The impact of squawfish on salmonid populations: a review. North American Journal of Fish Managment 1:104-111.

Falter, M. 1969. Digestive rates and daily rations of northern squawfish in the St. Joe River, Idaho. Doctoral dissertation, University of Idaho, Moscow.

Forester, R.E. and W.E. Ricker. 1941. The effect of reduction of predaceous fish on survival of young sockeye salmon in Cultus Lake. Journal of the Fisheries Research Board of Canada 5:315-336.

Goodnight, W.H. and G. Mauser. 1974. St. Joe River cutthroat trout and northern squawfish studies. Idaho Department of Fish and Game. Job Performance Report, Project F-60-R-5, Job 2, Boise.

Gray, B.A., D.E. Palmer, B.L. Hilton, P.J. Connolly, H.C. Hansel, J.M. Beyer, P.T. Lofy, S.D. Duke, M.J. DParsley, M.G. Mesa, G.M. Sonnevil, and L.A. Prendergast. 1984. Feeding activity, rate of consumption, daily rations and prey selection of major predators in John Day Reservoir. US Fish and Wildlife Service, Prepared for Bonneville Power Administration, Project No. 82-3.

Hamilton, J.A.R., L.O. Rothfus, M.W. Erho, and J.D. Remington. 1970. Use of a hydroelectric reservoir for the rearing of coho salmon. Washington Department of Fisheries Bulletin Number 9, Olympia.

Heun, R. 1983. Lake Washington northern squawfish: life history, control methods, and impact on other species with emphasis on salmonids. Final review paper, Fisheries Cooperative Research Unit, Universtiy of Washington, Seattle.

Horner, N.J., L.D. LaBolle and C.A. Robertson. 1988. Regional fisheries management investigations, Idaho Department of Fish and Game, Job Performance Report, Project F-71-R-12, Job 1-c, Boise.

Horner, N.J., M.A. Maiolie, C.A. Robertson. 1989. Regional Fisheries management investigations, Idaho Department of Fish and Game, Job Performance Report, Project F-71-R-13. Job 1-c, Boise.

R189RPT

House, N.R., 1966. The structure and movement of fish populations in Round Lake, Idaho Master thesis, University of Idaho Graduate School, Moscow.

Hubert, W.A. 1983. Passive capture techniques. Page 95-122 in L.A. Nielsen and D.L. Johnson, editors. Fisheries Techniques, Southern Printing Company, Inc., Blacksburg; Virginia.

Jeppson, P. 1957. The control of squawfish by the use of dynamite, spot treatment, and reduction of lake levels. Progressive Fish Culturist 19(4):168-171.

Jeppson, P.W. and W.S. Platts. 1959. Ecology and control of the Columbia squawfish in northern Idaho lakes. Transactions of the American Fisheries Society 88:197-202.

Keating, J.F. 1958. An investigation of the spawning habits and movements of nongame fish species, particularly squawfish, and evaluation of the findings regarding possible methods of control; a study of applicable methods of controlling nongame fish species; the efficiency and economics involved. Idaho Department of Fish and Game, Job Performance Report, Project F-22-R-4, Boise.

Keating, J.F., O. Kiigemage, L.C. Terriere, and R. Swan. 1972. Recent developments in the testing of squoxin, a pesticide selectively lethal to squawfish. Pages 609-623 in Proceedings of Fifty-second Annual Conference of Western Association of State Game and Fish Commissioners, Portland, Oregon.

Lewynsky, V.A. 1986. Evaluation of special angling regulations in the Coeur d'Alene River trout fishery. Master's thesis, University of Idaho, Moscow.

MacPhee, C. 1967. The determination and development of chemicals for the control of undesirable species of fish. Operational Studies Contract 14-17-0001-1564, Columbia River Fisheries Development Program, University of Idaho, Moscow.

MacPhee, C. 1969. The effect of squawfish eradication on trout survival. Pages 209-218 in Proceedings of the Forty-ninth Annual Conference of Western Association of State Game and Fish Commissioners.

MacPhee, C. and G.E. Reid. 1971. Impact of northern squawfish on survival of fingerling rainbow trout. Idaho Department of Fish and Game, Job Performance Report, Project F-60-R-2, Job 2, Part I, Boise.

Malvestuto, S.P. 1983. Sampling the recreational fishery. Pages 397-419 in L.A. Nielsen and D.L. Johnson, editors. Fishery Techniques. American Fisheries Society, Bethesda, Maryland.

Maxfield, G.H., K.L. Liscom, and R.H. Lander. 1959. Leading adult squawfish Ptychocheilus oregonensis within an electric field. US Fish and Wildlife Service, Special Scientific Report--Fisheries Number 298.

Ortmann, D.W. 1973. St. Joe River cutthroat trout and northern squawfish studies. Idaho Department of Fish and Game. Job Performance Report, Project F-60-R-4, Job II, Boise.

Pollard, H.A. II. 1972. Squawfish control in Anderson Ranch Reservoir. Idaho Department of Fish and Game, Summary Report, Project F-53-R-17, Job III-a, Boise.

Reid, G.E. 1971. St. Joe River cutthroat trout and squawfish studies. Idaho Department of Fish and Game, Job Completion Report, Project F-60-R-2, Job 2, Boise.

Rieman, B.E. and N. Horner. 1985. Region I river and streams investigations. Idaho Department of Fish and Game, Job Performance Report, Project F-71-R-9, Job 1-c, Boise.

Robertson, C.A. and N.J. Horner. 1986. Region 1 River and Stream Investigations. Idaho Department of Fish and Game, Job Performance Report, Project F-71-R-10, Job 1-c, Boise.

Rulifson, R.L. 1984. Investigation of the process for registration of squoxin for squawfish control. Final Report prepared for Bonneville Power Administration, Project 83-428.

Watson, R.E. 1973. 1973 squoxin (1,1'-methylenedi-2-naphthol, sodium salt) application to the Chehalis River System. Mimeo report, Washington Department of Game, Olympia.

JOB PERFORMANCE REPORT

State of: Idaho

Project No.: F-71-R-14

Job No.: Job 1-d

Name: REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

Title: Region 1 Technical Guidance

Period Covered: July 1, 1989 to June 30, 1990

ABSTRACT

Region 1 management personnel provided private individuals, organizations, and state and federal agencies with technical guidance, review, and advice on projects associated with, or having impacts on, the fishery resource or aquatic habitat in Region 1. The guidance included written comments on 157 documents.

Authors:

Ned Horner
Regional Fishery Manager

R189RPT

OBJECTIVES

1. To direct land use decisions in Region 1.

2. To furnish technical assistance, advice, and comments to other agencies, organizations, or individuals regarding any items, projects, or activities that are associated with, or may have an impact on, the fishery resource or aquatic habitat of Region 1.

3. To comment on environmental impact statements, provide input regarding timber sales, small scale hydropower projects, highway construction, stream alterations, EPA discharge permits, dock and boat basin development, gas and electrical transmission lines, land use planning, and other environmental impacts on the fishery resource or aquatic habitat of Region 1.

METHODS

Through personal contact, project and document review, and field inspections, we made comments and provided advice on projects or activities associated with or impacting the fishery resource or aquatic habitat of the region.

RESULTS

During 1989, Region 1 fishery management personnel responded to 157 requests for written comment from various agencies (Table 1). The majority of requests were handled by the Regional Fishery Manager in an attempt to free-up the Regional Fishery Biologists' time for data collection and analysis. The current technical guidance workload will require additional personnel, more equitable distribution between existing fish management staff personnel at the sacrifice of more active fisheries management or eliminating comments on activities that effect fish habitat.

Numerous presentations and programs were made to civic and sportsmens' groups throughout the year.

In addition to routine comment and technical guidance, a number of issues required considerably more effort and involvement by regional personnel.

Table 1. Written technical guidance comments by agency and Idaho Department of Fish and Game Region during 1989.

Region or Bureau	Bureau Land Manage-ment	Corps of Engineers	U.S. Forest Service	U.S. Bureau of Reclamation	Environ. Protection Agency	Idaho Dept. Lands	Health & Welfare	State Clearing-house	Dept. Transpor-tation	Dept. Water Resources	Misc.	Total	Per cent
Region 1	4	12	42	--	3	41	--	--	9	23	23	157	35
Region 2	1	1	23	--		1	--	--	3	11	14	54	12
Region 3	1	--	9			7	--	--	4	8	13	42	9
Region 4	4	--	3	--	1	--	--	--	1	--	1	10	2
Region 5	--	--	--	--	3	--	--	--	--	4	1	8	2
Region 6	12	2	48	--		17	2	--	6	80	14	181	40
Program Coordination													
Fisheries													
Wildlife													
Total	22	15	125	0	7	66	2	0	23	126	66	452	
Percent	5	3	28	0	2	15	>1	0	5	28	15		

R9FM51AH

Lake Water Quality Concerns

Continued concern over cultural eutrophication of North Idaho lakes led to the establishment of two pieces of legislation in 1989. The Nutrient Management Act was established to require water quality assessments and lake management plans to be developed prior to any management actions being taken. This legislation was supported by the Southern Idaho phosphate industry due to the concern that cities were banning the use of phosphate detergents prior to determining their role in degrading water quality. This legislation became law but failed to be funded.

The Clean Lake Act was also passed and did receive funding. The Clean Lake Council and Technical Advisory Committee were established to review lake water quality assessments and make recommendations on whether the data were sufficient to develop and implement lake management plans. Funding supported the development of educational materials for the general public and coordination activities. Ned Horner testified at legislative hearings and participated in review of lake water quality assessments on the Technical Advisory Committee.

North Idaho and Spokane area communities have unanimously supported phosphate bans in laundry detergents. It appears that public awareness and support for measures to protect water quality are gaining momentum.

Antidegradation

Ned Horner spent numerous hours providing input to individuals, organizations, and agencies on the fishery resources in stream segments proposed for nomination as segments of concern. The Basin Area Meetings were attended, and some input will likely be required during the development of site-specific BMP's in the working committee meeting planned for 1990.

Water Resources Comprehensive State Water Plan

The Water Resources Board has given specific rivers in the state interum protected status until a comprehensive management plan can be established to guide the development of river water resources. Priest River, from its headwaters to the Pend Oreille River, is currently under the interum protected status and must have a plan established by July 1, 1990 or it will lose all consideration for protection by law. Melo Maiolie participated in several meetings and provided technical guidance and review of the comprehensive management plan that is being developed. The plan will guide management activities that will influence both water quality and quantity and will help to focus research needs. It is hoped that by participating in this process, the fishery resource and resource users will receive greater consideration in land management and water allocation issues.

Forest Practices Act Committee

Ned Horner continued to serve on the Forest Practices Act Committee and Riparian Subcommittee during 1989. Efforts continued to focus on establishment of leave-tree requirements in riparian areas.

An additional area of concern centered on the adequacy of existing guidelines for culvert placement. Currently, water resources minimum standards are used to guide culvert sizing. These standards only require sizing to handle a 10-year flood. When timber harvest occurs in a watershed above a culvert, total and peak runoff increases which further reduces the effectiveness of the culvert to handle flows. Drainages influenced by rain-on-snow events have shown a very high rate of culvert failure and subsequent damage to fish habitat. Efforts were being made to establish more realistic culvert sizing guidelines.

Timber Industry

Several issues related to timber harvest in North Idaho required considerably more time than the routine review of Forest Service timber sales. The Panhandle Forest Plan currently uses fine sediment as an indicator of fish habitat conditions. Due to the differences in geology and lack of good relationships between land management activities and sediment transport and delivery to streams, fine sediment as it is currently being assessed and applied is a poor indicator of habitat condition.

Rearing habitat may be a much better indicator of habitat condition, but there are currently no acceptable methods of assessing the impact of land management impacts on rearing habitat. Efforts are being made to better understand factors that influence rearing habitat, such as bedload sediment and peak flows, and to develop new thresholds to insure fish habitat is protected.

The existing constraints placed on timber harvest by the Forest Plan are being challenged by the timber industry and Department of Lands. Shortages of timber and high timber prices are forcing drainages that have been "unscheduled" for timber harvest because of watershed damage to be considered for more harvest. Harvest proponents maintain that application of BMP's will protect water quality. We are attempting to show that fish habitat is not being protected by existing BMP's, and that a limit to road building and harvest in a watershed must also be established.

Forest Service funding for habitat improvement projects has increased, and a more comprehensive review has been required to insure that projects are appropriate and prioritized. The high turnover rate of district rangers and fishery biologists has required additional coordination to insure awareness of fish management concerns.

Department of Lands has become more concerned with protecting water quality and fish habitat, and districts are seeking Fish and Game input to help better guide their activities. The Forest Practice Act Coordinators have asked for our assistance in reviewing proposed timber sales, designating Class I and II streams, developing demonstration habitat improvement projects, evaluating the effectiveness of of BMP's in protecting fish habitat, and assisting with developing BMP's for stream segments of concern.

Highway Construction Projects

Several major highway reconstruction projects continued to require added input and coordination. The upgrade of Interstate 90 along Coeur d'Alene Lake ran into some problems when the timing of the 5.3 acre fill in the lake would cause the loss of a significant portion of the 1989 year class of kokanee. Agreements were made to allow the fill to proceed, but require mitigation for the loss by creating additional shoreline spawning areas in the lake.

The filling of the lake began in March of 1989 but soon ran into problems. The new fill failed twice, causing a portion of the existing highway to also slide into the lake. We expressed our concern about the use of fine material rather than rock to construct the fill. Due to continued problems with fill stability, the highway was re-designed to eliminate the need for the fill entirely. The fill was capped with large angular rock and overlayed with spawning-size gravel to provide a productive spawning bed for kokanee. Off-site drainage of fine sediment from new cut and fill slopes still needed to be addressed.

The reconstruction of Fernan Lake will begin in July of 1990 after high water has receded. This project is also associated with the reconstruction of I-90.

High water had stabilized and sealed most of the Cedar Creek channel along I-90. There are still some unbaffled culverts and areas that will require repairs and maintenance. The contract was left open through July of 1990 to allow the needed work to be done.

State Highway 95 north of Sandpoint is also being upgraded, and a major portion of Sand Creek and possibly a new crossing of the Pend Oreille River will impact fish habitat. Input was provided to minimize impacts to fish habitat.

Wolf Lodge Creek CRMP

Excessive bedload sediment in the lower portion of Wolf Lodge Creek has created a situation where existing channel capacity cannot handle normal bank full discharges. Bank destabilization, property damage, and loss of critical spawning and rearing habitat for westslope cutthroat has resulted. Dr. Don Reichmuth from Geomax Corp. was hired as a consultant to provide input on stream instability problems and develop **a** comprehensive plan to address the problem.

Geomax will develop a conceptual design of the stream stabilization project first and will assist in presenting it to the public. If public and agency support is obtained, we will also fund the development of a final design and hire Dr. Reichmuth to supervise the actual construction. Rocks for the project will be available in June of 1990 prior to a rock pit being reclaimed. If we are not able to take advantage of this source of rock, construction costs will increase dramatically.

Mining

The continued high price of gold and improved extraction and processing techniques have started a gold mining boom in drainages of the Coeur d'Alene River. Numerous placer mining operations on the East Fork of Eagle Creek will impact over five miles of stream habitat alone. There is also interest in developing large open-pit copper mines in the area.

We made a major effort to bring all the regulatory agencies as well as the Program Coordination Bureau up to speed on the need to establish guidelines that will better protect the long-term viability of streams and riparian areas. Out of this effort came a clearer Department policy when dealing with mining operations and much stricter stream rehabilitation requirements from the regulatory agencies. Streams will still be mined, but it is hoped that now they will be left in a condition that will promote healing much more quickly than in the past.

Challenge Grant Projects

Considerable time was spent developing Department Challenge Grant projects with sportmens' clubs. Emphasis was placed on increasing fishing opportunity for shoreline anglers. Fishing docks were constructed or were proposed for Sinclair, Perkins, Fernan, Pend Oreille, and Hayden lakes and Cocolalla Slough on the Pend Oreille River. Challenge Grant funds were also used to provide net-pen rearing facilities for the cutthroat supplementation program in Pend Oreille Lake.

RECOMMENDATIONS

1. The loss of aquatic habitat due to land use development, stream and lake encroachment, and pollution is a continuing and expanding problem. Current demands for technical guidance and the level of involvement necessary to effectively influence these decisions exceed the time management personnel are able to contribute. This type of

activity is critical to slow the continual loss of aquatic habitat, but does not directly benefit the angling public by providing any enhancement through management of existing fisheries. To accomplish both the habitat protection and the more intensive fishery management necessary under increasing demand, additional manpower is necessary. A person dealing strictly with habitat protection issues would allow the Regional Fishery Manager and Biologists more time to devote to aggressive "proactive" fishery management.

2. Appropriate technical guidance to protect private and public property adjacent to streams, while minimizing damage to aquatic habitat, has been unavailable. Development of a booklet detailing alternatives for stream stabilization should be considered. A cooperative effort between the Department of Water Resources and the Soil Conservation Service may be useful. In the meantime, the Department of Water Resources should be encouraged to take a more active role in technical guidance or referral. Minimum standards for stream alterations should be critically reviewed and modified to be more sensitive to fish habitat and stream channel dynamics rather than site-specific needs of a property owner.

3. Impacts to Region 1 streams from roading and timber harvest have severely degraded trout and char spawning and rearing habitat. Research to date has focused on the impact of fine sediment on early life stages of salmonids. Many Region 1 streams are further impacted by excessive bedload sediment and loss of large woody debris, resulting in major losses of summer and winter rearing habitat for all salmonid life stages. The need to better quantify the relationships between land use activities, stream channel dynamics, sediment transport, and storage and fish habitat should be a high priority of fishery research.

4. Shoreline encroachment activities on natural lakes and waterways in Region 1 are increasing dramatically. Activities include construction of bulkheads, breakwaters, boat ramps, entertainment docks, and sandy beaches. Naturally diverse and stable shorelines are being converted into private recreation sites. Fish habitat is being negatively affected by loss of diverse cobble and rock substrate and large woody debris, fine sediment deposition from upland and beach erosion, and changes in littoral drift patterns. Public resource users are often excluded from using areas that have been converted to private use. Fish and Game concerns have been reflected in recent permit modifications and/or denials, but clear objectives have not been established by the regulatory agencies. The Army Corps of Engineers and State Department of Lands should establish policies that address future public needs and the cumulative impact of private encroachments on aquatic resources.

Submitted by:

Melo A. Maiolie
Regional Fishery Biologist

James A. Davis
Regional Fishery Biologist

Ned Horner
Regional Fishery Manager

Approved by:

IDAHO DEPARTMENT OF FISH AND GAME

Jerry M. Conley

Jerry M. Conley, Director

Steven M. Huffaker

Steven M. Huffaker, Chief
Bureau of Fisheries

Al Van Vooren

Al Van Vooren
Resident Fisheries Manager